DEC 10 1934

Factory

MANAGEMENT and MAINTENANCE

December • 1934

Unemployment Insurance
Why? What Kind? Who pays?

What to Do With NRA
Industry Offers a Better Plan

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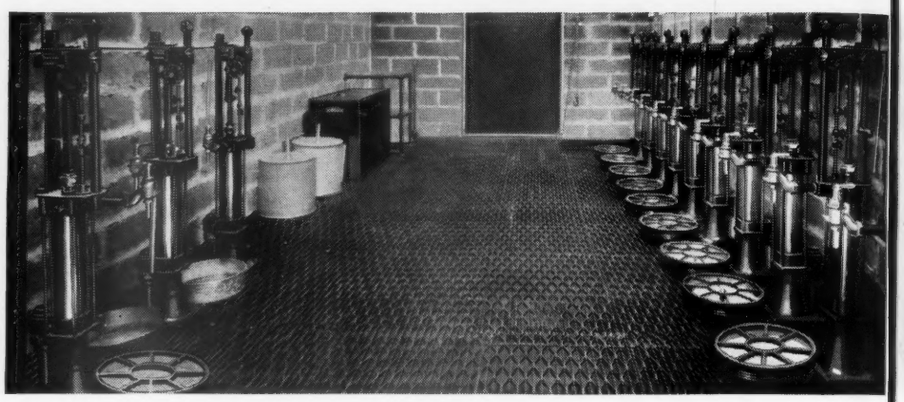
CORRECT LUBRICATION

Do YOU KNOW how much the quality and economy of your entire plant's lubrication depend on the . . . STORAGE and HANDLING of LUBRICANTS?



A LUBRICANT in use is nothing more than a flexible, constantly renewing, slippery film placed between moving surfaces to keep them from grinding together with resultant wear, heat, and tremendously increased power consumption. One basic requirement naturally is that the lubricant must be clean. The presence of dirt or moisture in a lubricant has harmful effects which are not generally understood. Care in storage and handling is just as important as clean delivery to your plant. The following excerpts from a paper prepared by the Technical Staff of the Standard Oil Company (Indiana) are interesting:

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" . . . Lubricants may be stored in too hot or too cold a place where the temperatures may tend to break down any compounding in the lubricant."

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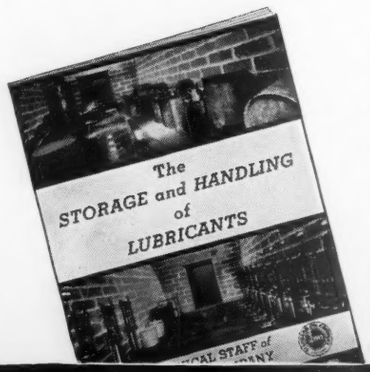
"In addition to foreign contaminants, the mixing of different grades of oil will often cause lubrication difficulties . . ."

(Practical suggestions are given for the removal of contaminants, and the rules of safety which must be observed in cleaning tanks.)



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FACTORY
MANAGEMENT and MAINTENANCE

A consolidation of *Factory and Industrial Management* (including *"Factory"*) and *Maintenance Engineering*

DECEMBER, 1934

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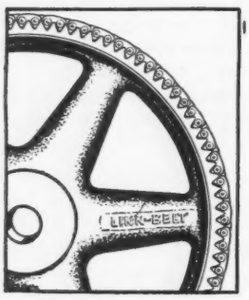
POSITIVE DRIVE
NEWS

Devoted to Solving Industry's Power Transmission Problems

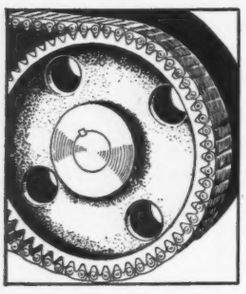
Production Increased!

"This 150 H. P. Link-Belt silent chain tile machine drive solved a very difficult problem for us," says Mr. A. U. Cote, Cooksville Co. Ltd. "Previously we had tried every form of flexible drive. Some had failed miserably—all were a constant source of trouble, resulting in loss of production and high maintenance costs. The Link-Belt drive has all the flexible qualities of these other drives, yet it is positive, strong and durable. It reduced our maintenance costs and increased the production of the machine—in fact our superintendent reports that this machine reached its rated capacity for the first time when this drive was installed."



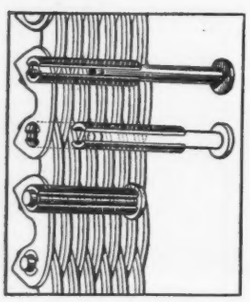
Maintains Rated Capacity of Machine

Notice how the teeth of the silent chain mesh with the teeth of the wheel. Each tooth is in perfect working contact with the chain. Both engagements and disengagements are made gently, without jar or shock. This accounts for the smooth running — the almost noiseless action — the positive transmission, without slip.



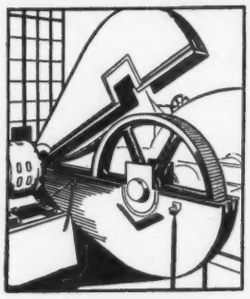
Superior to Gears

The reason for the superiority of the flexible silent chain over the gear drive is apparent. Notice in the illustration how work is distributed amongst all the silent chain teeth in play — covering about two-thirds of the wheel. Smooth operation and positive action are kind to the machine. Output is maintained. A better finished product should result.



Long Life Assured

See how the round pin works between two semi-circular, removable, case-hardened bushings. This joint construction, which allows a film of oil to follow the pin surface over the bearing area between the pins and the bushings, precludes rapid wear. Many Link-Belt drives installed 25 and 30 years ago are still in active daily service.



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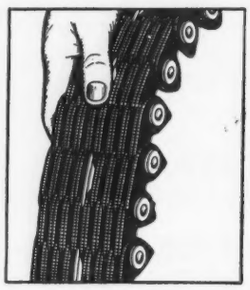
Once installed in the Link-Belt casing, the smooth-running drive is automatically lubricated. Workers cannot come in contact with any moving part. The only attention required is occasional replenishing of oil, just as does your automobile. The unit is simplicity itself.



A Chain of Distinctive Appearance

Silverstreak is the new name for this distinguished power transmitter. Its links are blued and the washers and guide links silver colored. When in motion the chain presents a silvery streak. Look for this identification as well as for our name on the washers.

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FACTORY
MANAGEMENT and MAINTENANCE

December, 1934

L. C. MORROW
Editor

Unemployment Insurance

Industry must help plan it, or else—

INDUSTRY must make up its mind about unemployment insurance. By "industry" we mean employers, executives, and workers, because every one of them will be affected.

What should be industry's attitude toward the legislation for unemployment insurance that will be presented at the next session of Congress?

It should be an attitude of constructive cooperation, based on a knowledge of the subject, coupled with a willingness to fight against the imposition of unfair financial burden.

BY CALLING for an attitude of constructive cooperation we mean simply that industry must know what it wants and must make specific recommendations to lawmakers and their advisers, or run the risk of taking what is handed out by that group.

In saying that industry's constructive cooperation must be based on a knowledge of the subject we are recommending serious study of what has been done, and what has been and will be proposed. The bibliography of literature on the subject is extensive and imposing. There is, however, a short cut, if the student will accept the findings of other students who have written relatively brief analyses. (See page 550, this issue.)

The meaning of "take what is handed out" is obvious. There is, for example, the Wagner-Lewis bill of recent date, which proposed an excise tax of 5 per cent of wages. This rate is high to begin with, obviously could be adjusted upward. There is, also, the Townsend proposal of $200 per month old age pension—ridiculous, of course, but very appealing and receiving much acclaim in certain quarters.

In reaching conclusions as to what terms of unemployment insurance are feasible and justifiable, it must be kept in mind that industry as such was not responsible for the depression. Individuals in industry, by exercising their speculative proclivities, had something to do with it, to be sure, but their errors in judgment in that respect cannot be charged against our fundamental industrial set-up. It would be unfair for industry to be forced to pay for more than its share of the responsibility, to be saddled with the burden of *relief* as well as the burden of a transition or dismissal wage.

It must be remembered, also, that the addition upon industry's costs of too heavy a burden, in the form of levies for unemployment insurance, would result in higher prices that would reduce distribution, and so add to unemployment.

On the other hand, if the burden is not too great, it probably can be absorbed without shock, as was the burden of workman's compensation insurance. Obviously employers would have an incentive to reduce turnover, with consequent stabilization of employment. A negative corollary would be a strong tendency to make use of all available methods and equipment to prevent increases in the number of employees. Increased technological unemployment would result, as it did with the adoption of arbitrary wages.

WE CONCLUDE that the problem must be faced, and that probably now is the time to do it. Manufacturers won't, if left to themselves, as was proved in Wisconsin, whose manufacturers during 18 months did not do enough to avert the law that is now in effect. But we say that industry must know what it is all about, and offer its own plan instead of confining its action to opposing what is offered from other quarters.

(The articles beginning on the two following pages will help you start your study.)

Unemployment Insurance

Reasons For It

Excerpted from an address before the American Institute, these unofficial remarks at least hint at what the Administration may have in mind

THOMAS H. ELIOT
Associate Solicitor, Labor Department
Member of Technical Advisory Committee
Studying Social Legislation

AMONG the largest of the shadows that fall across the lives of most of our people is the fear of unemployment and of destitution in old age. The advance of industrial civilization has lengthened these shadows, for the shift from the farm to the factory alone was enough to make an individual's position far less secure than heretofore. Our Government has been slow to notice economic bondage in any form, but the last five years have opened our eyes. Today there is an insistence that governmental action be taken to counteract these evils which so-called industrial progress has produced.

In response to this demand for action the President last June appointed a Committee on Economic Security to suggest a practical program for meeting the most imperative individual needs.

It is the long view which the Committee is taking. For it is the rash prophet who assumes that once recovery is achieved private employment levels will be high and employment stable.

Even in '28 and '29

Let me turn back for a moment to the days when we were about to abolish poverty. Among the unions affiliated with the American Federation of Labor in 1928, 13 per cent of the workers were unemployed for at least six months in that year, and 11 per cent were not earning anything for at least six months in 1929. In those years the best statistics available would indicate that more than 2,000,000 were out of work over a quarter of the time. In 1929 in the automobile industry, which was then reaching its peak, only 60 per cent of the wage earners had a full year's work with 157,000 men out of work from one to six months. These are but a few typical examples. I do not believe that there is any reason to expect steadier conditions in the near future.

To lay aside reserves for periods of unemployment seems the most obvious step that can be taken. If it would mean raising money at a time when it is not impossible to raise it, and if it would result in a great financial saving to the Government, more freedom from fear for the unemployed, and altogether a more stable industrial community, it is a step which should be taken.

It was figured by actuaries that if an unemployment insurance system had been begun in 1923 in Ohio, with premiums amounting to 4 per cent of payrolls and benefits paid to unemployed for 26 weeks at a rate of not more than $15 per week, all of the industrial unemployed in the State of Ohio would have been taken care of for two full years after the beginning of the depression, with a surplus remaining at the end of 1931 in the amount of $19,000,000.

Under a somewhat different plan proposed for Minnesota with the same premiums, but with a long

(Continued on advertising page 38)

19 Questions About It

Asked at the Fourth Summer Conference on Industrial Relations, Princeton University, they will help to shape your thinking*

T. H. A. TIEDEMANN
Director, Industrial Relations Counselors, Inc., New York

ON JUNE 29, 1934, the President announced the appointment of a Committee on Economic Security charged with formulating a program of social legislation for introduction in the coming session of Congress. It seems obvious that employers, who will be called on to finance a considerable part of this program, are hardly less interested in its character than the men and women whom it is intended to benefit. Too often in the past a similar situation has provoked nothing but massed opposition from industrialists. I have little patience with employers who use such power as they have simply to balk change. The times are against them; if they will not concern themselves with shaping legislation, they will take the consequences in the form of unsatisfactory laws. Therefore, I urge employers to interest themselves in the character of the proposed measures and in that way exercise effective control over their character.

We are particularly concerned here with the unemployment phase of the program. Employer cooperation may manifest itself most advantageously in two ways:

1. Companies and/or industries may immediately go about the initiation of voluntary plans. Undoubtedly the existence of these schemes would affect legislation, particularly if they were on an industry-wide basis.

2. Companies and/or industries may agree on certain principles that they wish incorporated in state or federal laws and present their ideas to the suitable bodies.

**As presented in* Personnel, *November, 1934*

As an aid in considering the basic problems involved, the following questions should be helpful:

1. Should unemployment insurance be regarded primarily as a measure of relief (i.e., as in the Ohio bill) or as a means of reducing the amount of unemployment (i.e., as in the Wisconsin law)?

Decision regarding this principle affects decisions on the following:

a. Should contributions be pooled in a single state or national fund or by industries; should company reserves be set up?

b. Should contributions be collected from employers alone or from employers and employees?

c. Should contributions be collected from government sources?

d. Should rates be varied in accordance with unemployment experience?

2. Should the plan emphasize provision for long- as against short-term unemployment?

Decision as to this principle affects decisions on the following:

a. Is a short or long qualifying period desirable?

b. Is a short or long waiting period desirable?

c. Should employer contributions be exhausted before employees' contributions are drawn on?

3. Should a national unemployment insurance system be established in preference to (1) independent state systems or (2) state systems subject to federal supervision?

4. Should short-time unemployment be compensated at the same rate and under the same conditions as full-time unemployment?

5. Are contributions to be set

a. As flat rates, or

b. As a flat percentage of wages?

6. If both employers and employees contribute, should they pay at the same rate?

7. Should a maximum wage base be set beyond which employees' earnings will not be considered for contributions?

8. Should a merit-rating technique be applied to setting contributions of individual companies, industries, or groups of industries?

9. Should it be in force from the outset or after a specified number of years?

10. How long a period should be allowed for collection of reserves?

11. If industry or company funds are permitted, how should they be trusteed?

12. Should weekly benefits be identical for all employees or should they be a proportion of the employee's normal weekly earnings?

13. Is a low benefit for a considerable period preferable to a higher benefit for a short duration?

14. Should dependents' allowances be paid?

15. Should the number of weeks of benefit bear a relation to the number of weeks of contribution?

16. Is the alternative of a maximum annual payment preferable?

17. What part should industries or companies have in administering the system? Should their representatives sit on advisory bodies that have wide authority over rate-setting?

18. What procedure, record system and other mechanism should be adopted for registration of applicants for benefit, placing them in any available suitable employment, testing their willingness to work (as, for example, requiring applicants to register at a public employment office), distributing benefit payments, and hearing and settling claims and appeals?

19. Should the major objective be a self-sustaining insurance institution with benefits limited to what can be provided out of contributions or should the fund be permitted to maintain its established rate of benefits by borrowing or other distress procedures?

Who Will Pay the Bill?

Shall it be the employer, the employee, the taxpayer, or what combination of these?

JOHN R. HALL
President, John R. Hall Corporation, New York

TO END the present depression, we must somehow or other restore and stabilize the buying power of the wage-earner. To prevent similar depressions in the future, we must see to it that the normal wage-earner, who is able and willing to work, does not suddenly lose his buying power.

This is precisely the object of social insurance. Consequently far-sighted people have come to see that a practicable, just, and effective program of social insurance that enables the wage-earner to protect himself and his dependents from loss of income due to any of the inescapable hazards of life is a necessary factor in economic stability and enduring prosperity.

Assuming that this view will become generally accepted, as it probably will, there is still room for much honest difference in opinion as to how such a program shall be put into effect. This applies especially to plans providing for unemployment reserves, upon which attention is now being focused, and at the center of controversy is the question, "Who shall pay the bill?"

Reserves for the use of wage-earners in times of unemployment may be accumulated by the wage-earners themselves, by the employers, or by the state, or by any combination of two, or by all three.

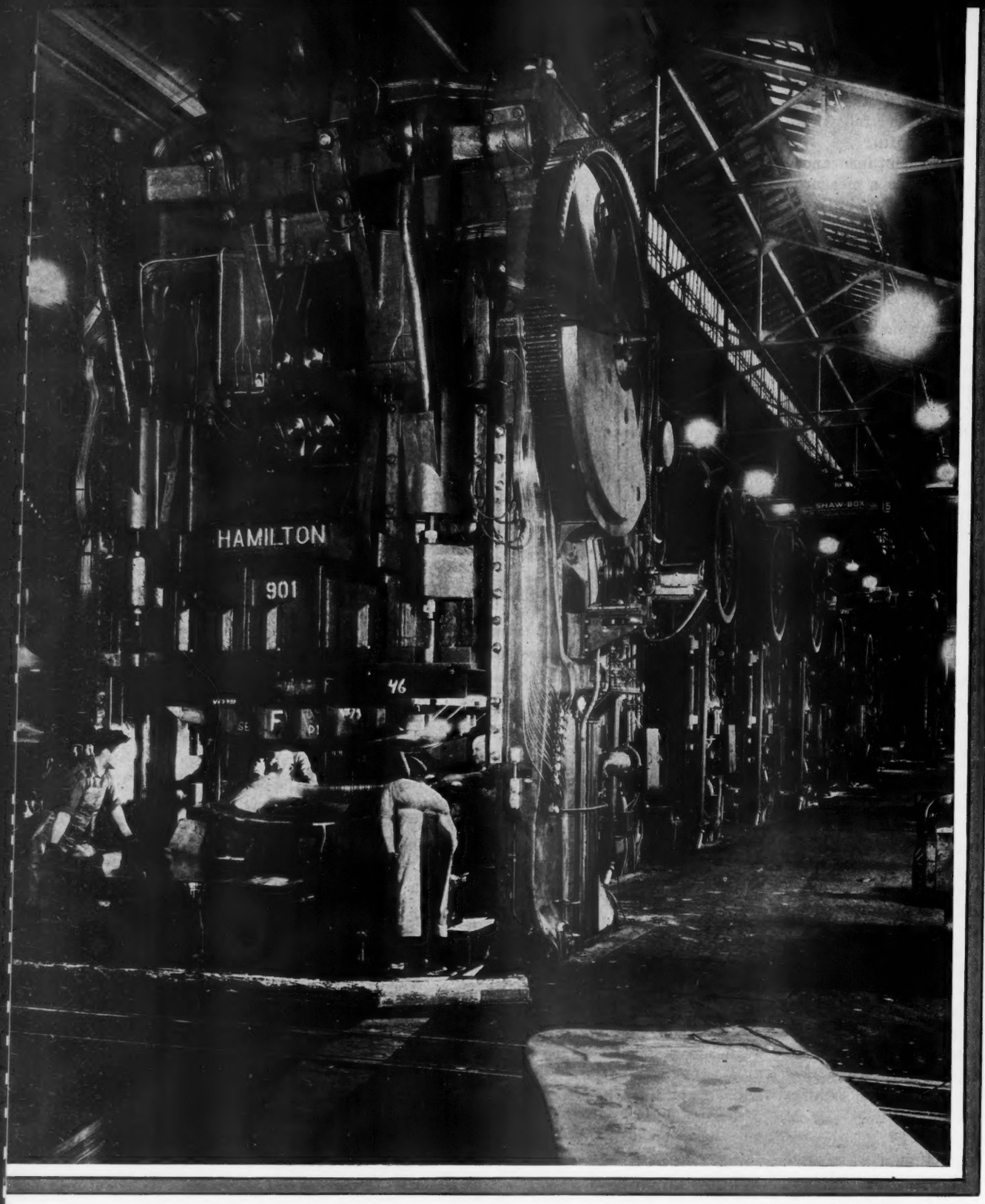
In Wisconsin, the Employer

In the Groves "Unemployment Insurance" Act, passed by Wisconsin in 1932, the employer pays the bill. Each employer contributes to a fund held by the state until an amount averaging about $75 is available for each of his employees in event of unemployment. As this particular act may serve as a model for further legislation in this country, the soundness of the principle it embodies is worth examining.

Advocates of the Wisconsin plan advance several arguments in its support.

Since an employer pays for the upkeep of an idle machine, say these proponents, he should likewise pay for the upkeep of an idle worker. This argument is specious but dangerous if pressed too far, for the answer to it is that, if the employer

(Continued on advertising page 38)



Stamping presses at Plymouth Motor Corporation

Any era of prosperity must be accompanied by an era of productivity in which extensive use is made of technological development, in which high output per worker is achieved

Industry's Recovery Plan

Text of a proposal made by the National Association of Manufacturers concerning the future relations of government to industry

MEETING a long-standing challenge for constructive criticism, the National Association of Manufacturers late in November formulated a "recovery plan" looking toward revision of the NRA. It was distributed to 7,000 business men, to be acted upon at the Congress of American Industry called by the Association for session in New York on December 5 and 6.

The plan proposes continuing the best of the NIRA, but with an additional year of study before enactment of permanent law. Here is unmistakable evidence of the business leadership which the country has needed.

If these proposals are carried out, there will come about a genuine cooperation of government and business. They constitute a recovery program that all industry should feel obliged to study, and concerning which it should voice its conclusions.

Here follow the three proposals of the Committee on Future Relations of Government to Industry, which constitute the plan referred to and are a major part of a complete platform.

I. Expiration of National Industrial Recovery Act

By its own terms the National Industrial Recovery Act expires not later than June 16, 1935. Prior to its expiration, new legislation should be enacted in order that those functions of the National Industrial Recovery Act which have proven worthy of further trial may be continued. Provision should be made for the transition period by permitting industries in which codes are working satisfactorily, and which voluntarily desire to do so, to continue to operate under these codes temporarily, pending revisions necessary for adjustment to the new legislation.

II. Temporary Continuation of Labor Provisions of Code

The Committee recommends that the Congress be urged to enact for a period of one year from the expiry date of the present National Industrial Recovery Act (June 16, 1935) appropriate legislation which would permit the continuance, during the period named, of the labor provisions prescribed in existing codes, pertaining to child labor, minimum wages, maximum hours and collective bargaining, with clarifying definitions of collective bargaining and provisions for more elastic working hours added.

There is much doubt about the constitutionality of Federal regulation of local employment relations and the administrative powers relating thereto, contained in the National Industrial Recovery Act. Assuming they rest upon the assertion of emergency authority, it is obvious the emergency will pass. In the light of long accepted decisions of the United States Supreme Court, the validity of these controls will undoubtedly be questioned. If there are advantages in these measures, which are in the interest of labor and of the public, the question of preserving them, by appropriate legislation in the several states, is a problem for careful consideration.

The temporary Federal measures proposed above should be administered by the Department of Labor. Enforcement of the proposed act should be through a court of competent jurisdiction on the basis of fact as well as law, enforcing its decisions through enjoinment and subsequent penalties in case of continuance.

III. Enactment of Fair Trade Practice Act

The Committee recommends that Congress be requested to enact for a temporary period a Fair Trade Practice Act to become effective on the expiration of the National Industrial Recovery Act. This act should under governmental regulation and after proper investigation in public hearings if such action be shown to be in the public interest, permit any industry, trade or other representative group voluntarily desiring to do so, to adopt and make effective a code of fair competitive practices containing prohibition of unfair practices and permitting if desired, provision for publicity of prices. This would prevent competitive practices that are destructive of the welfare of such industry and its employees and that are ultimately injurious to the public interest, and permit competitive practices most certain to assure the welfare of industry, its employees and the public.

Administration

Such legislation should be administered by an independent administrative court of five members possessing the authority to approve or disapprove codes of fair trade practices in interstate commerce that had been voluntarily submitted by a defined representative majority (preponderant both as to numbers and volume) of a given group, trade or industry.

The standard or rule by which the administrative court would be guided in rendering decisions should be established by Congress. It should prohibit injurious and destructive acts of competition. It should prescribe limitations on competitive practices enforceable within the group in order to preserve the fair competition sought. Such legislation should declare and enforce prohibition against marketing agreements, limitation of output, fixing of prices or other practices which might become oppressive to small enterprises, except as they are determined, by the administrative court, to be in the public interest,

and are carried on by such industries under adequate governmental supervision. The act should be limited in its application to those industries that are engaged in or directly affect competition in interstate commerce. Court decisions in connection with existing laws indicate that such an act would be constitutional.

Voluntary Codes

The development and submission of such codes of fair practice should be voluntary on the part of industry and subject to approval or disapproval by the administrative court, with opportunities for resubmission on modification to the same authority. The writing of the code in whole or part by the administrative court should not be permitted, but that privilege and duty should be placed solely upon the petitioning industry. An approved code should likewise place upon the industry the primary obligation of policing enforcement, with the aid, on proof of violation, of the administrative court and ultimately through a judicial order.

Majority Rule

Under appropriate safeguards the approved competitive practices and prohibitions submitted by the properly defined majority of a group, trade or industry should be binding upon the minority. A minority group, in the absence of a majority request, should likewise be authorized to request a code of its own, limited in effect to its own members and to a period that would automatically terminate when a majority of the industry began to operate under an approved code. No trade, group or industry should be required to submit or request a code, the entire action being voluntary and influenced only by the desire of a trade, group or industry to avail itself of the opportunity afforded under the law. Such action should not be influenced by boycott or threat of boycott by control of government buying or by extra legal process. Those industries or groups not submitting a code would continue to operate under the Anti-Trust Acts, and the legislation supplementary thereto.

To prevent confusion in the transition period between the expiration of the National Industrial Recovery Act and the development of codes under the plan proposed by the Committee, the competitive practice provisions of any existing code, unless objected to by a preponderant majority of an industry, should be continued in effect until the administrative court, after hearing, had opportunity to approve or disapprove of these provisions in whole or part; or until the industry had presented a new code or a modification of the old code to the administrative body on authority of a preponderant majority of its members. Existing codes would thus continue in effect without interruption until withdrawn either by the industry or by the administrative court after hearing. Industries not desiring to continue operating under the fair trade practice provisions of existing codes would so notify the administrative court.

Permanent Legislation

If upon trial such legislation should prove beneficial to Industry and in the public interest Congress could consider making it permanent prior to its expiry date.

In some natural resources industries, conservation is a matter of great public concern and may require specific treatment. These industries should be able to utilize such provisions of general legislation as outlined herein; but since those provisions may not be sufficient to meet the needs of the industries, and for the protection of the public interest, specific legislation should be considered to meet their requirements. Such legislation should follow the general principle that the greater the privileges extended, and the more nearly the results approach or tend toward monopoly, the greater the governmental supervision that is necessary to protect the public interest.

Statement of Principles

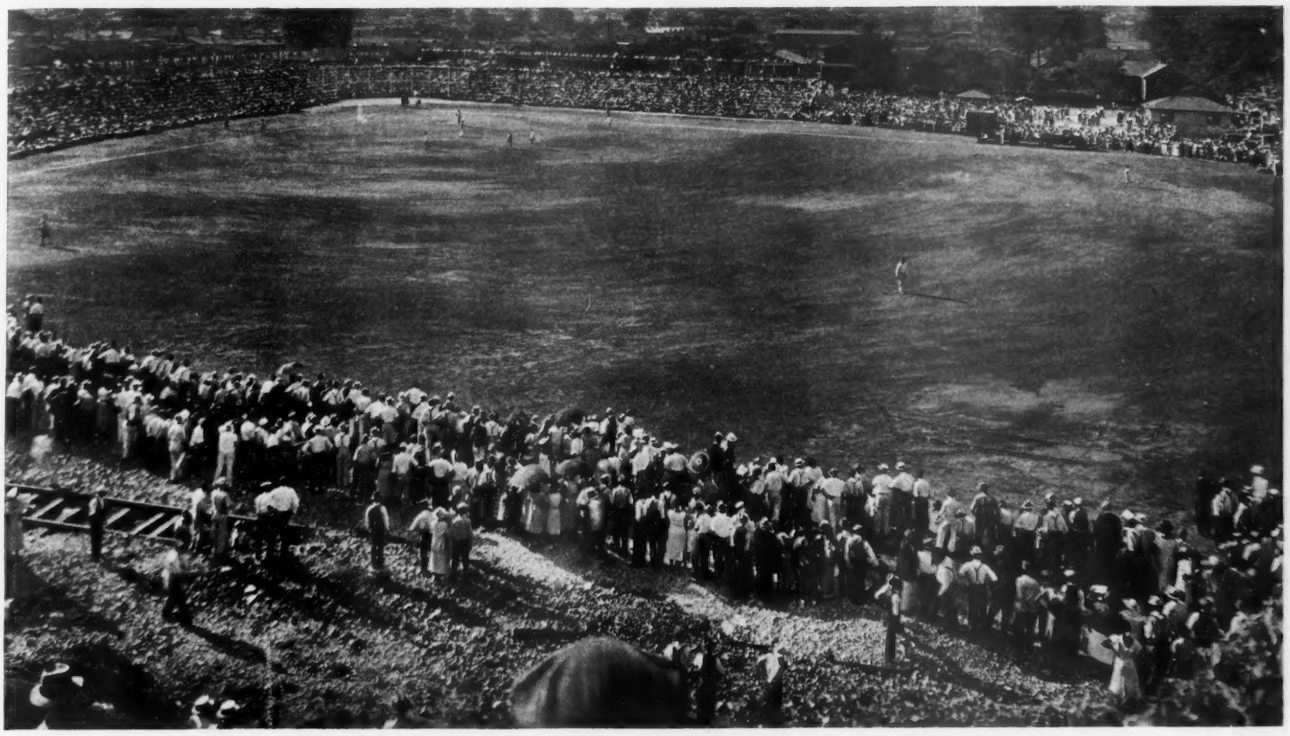
Your Committee restates the following principles upon which its recommendations are based.

Labor represents the energy, talent, training and capacity of individual men and women operating under a constitutional right to select freely their occupation and to negotiate the terms and conditions of their service individually or through an agency of their own choice. Employees engaged in manufacturing, for example, do not move in interstate commerce nor are their operations a part thereof. Their efforts are expended in acts of production or in services related thereto and the commodities produced may become a part of interstate commerce only when their service is concluded. All the employment relations in such production are local in character. The competitive practices sought to be controlled are directly and substantially related to the conduct of interstate and foreign commerce. Quite apart from the sound principles of regulation discussed above the supervision, interpretation and enforcement by Federal authority of local employment relations not only place an impractical burden upon the central Government, but judging from experience create confusion and conflict, and are not satisfactory either to the Government or to the parties involved. The suggestions of the Committee if acted upon would relieve the Federal Government of those forms of local control and regulation which have increased its burdens without yielding corresponding advantages.

Industry-Government Cooperation

It is recognized by employers, employees and the Government that the establishment of codes of fair competition especially by the voluntary act of competitors acting in unison, is in certain industries desirable and in the public interest. The suggested plan would provide a means of securing, with a minimum of executive enforcement, the free and effective cooperation of Industry and Government.

The Committee believes that the principle and policy of its plan would stand the light of authoritative law, would be workable and would represent a practical method of establishing a desirable transition from abnormal, highly centralized control of competitive practices to the normal and orderly method through which a free people in its own interest authorizes its private enterprises to demonstrate by voluntary action their capacity for self-organization and self-control, and self-enforcement of that control in the light of their experiences.



Place for Play

Not every plant can have a ball field or a swimming pool all its own. But any group of plants can do what they did in Birmingham

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Shorter work weeks mean more leisure. The Industrial Recreation Association is Birmingham's answer to a new responsibility which management shares with the community—the need to see that large blocks of free time are constructively used. A ball park for negroes is just one of a number of things the Association is doing

•

DOWN in Birmingham they feel that one of management's many jobs is to show employees how to improve their idle time. With that thought in mind, leading employers have organized the Industrial Recreation Association which, according to its papers of incorporation, is an educational and benevolent society that will proceed with a careful program of social and racial planning designed to make Birmingham a pattern for industry throughout the nation.

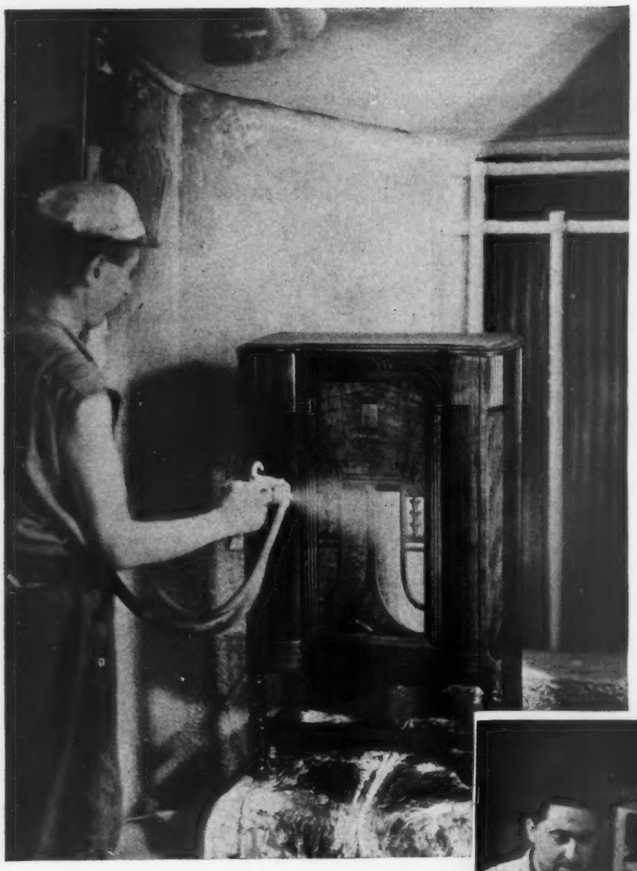
First of the Association's projects to be completed is a baseball park and athletic field for negroes, located on property of the Sloss Sheffield Steel & Iron Company, near the American Cast Iron Pipe Company's plant. Incidentally, it was constructed entirely by relief labor at a total cost of $21,368.72, materials and equipment being furnished by the two industries whose employees it will serve.

In the foreground of the photograph may be seen all that is left of the abandoned slag pile on which the athletic field was built.

Industrial employees have also been encouraged to make their own flower and vegetable gardens. Necessary plowing is done without charge. Prizes are offered for the best results.

These two things are cited as examples of the activities which the Association will undertake, but the charter specifically states that it does not intend to be "limited in scope by this recital of instances." They are but the first of many projects, including community centers, football fields, swimming pools, even the rehabilitation of negro settlements to provide good streets, alleys, drainage, etc.

Identical play facilities for white and colored employees are contemplated, and while such facilities are intended primarily for use by industrial employees, they will also be available for school use, for open-air singing, and other community activities of a worth-while nature.



More Product—and Better

Philco's schedules jumped. Problem: How to make, not just radio cabinets, but good furniture on a production basis?

Mass methods? Philco, fortunately, can take them or leave them. The cabinet getting its final coat of lacquer in the mass production way will be hand rubbed to the satiny finish characteristic of fine furniture. Such perfection of finish would be impossible to attain without the everlasting sanding and inspection that cabinets get "in the white"

A RADIO cabinet may be just a box to put the chassis in. It may also be a piece of fine furniture. Anyone can make boxes. Presumably anyone can make fine furniture. The trick, if any, is to adapt box-making methods to furniture building and not end up with something the cat dragged in.

At least that is the problem faced by the Philco Radio & Television Company's cabinet plant—a problem it has always licked in the past, is still licking at a time when production schedules have been advanced to a level where it actually seems as if this already over-taxed woodworking plant would burst. It is turning out more production per square foot of floor space than is usually possible in this type of manufacturing enterprise, and what it is turning out is better.

Naturally, interrupts the mass production enthusiast. It has to be, he explains.

In a measure that is true. Certainly you cannot make quality furniture on a production basis without machining to close tolerances, without careful attention to properly designed jigs and fixtures, without observing all the rules and regulations of good management. Don't ever fool yourself into thinking, however, that because you have the one you can't help having the other, that quality in mass manufacture takes care of itself. Actually, quality is something you have to harp on from morning till night with never a let-up.

An Old Tune

They harp on quality at Philco from the time panel stock, plywood,

shooks, and dimension stock enter the wood mill in the basement and on the first floor until finished cabinets are conveyed from the upper floors to the trucks that carry them over to the main plant where the chassis are waiting.

In fact, Philco has a quality tune which, simply sung, is this: A finished cabinet is never any better than it was in the white. Which means that every possible care is taken in machining, sanding, assembling, inspecting. In fact, the life of a radio cabinet, at least in the embryonic stages, is pretty much divided between sanding and inspection and back to sanding again.

Where to Draw the Line

Sanding has to begin early in the game. It is naturally much easier to sand a spreader, for example, before it is assembled than after it has become part of the finished cabinet. And, quite as naturally, sanding is done mechanically wherever possible, with the final touches put on by hand. It is a matter largely of knowing where mass manufacturing methods must stop and where good old hand craftsmanship comes in. There must always be the proper balance between the two.

Finishing requires equally close control over quality. The problem is still to adapt box-making methods to the production of fine furniture.

Cabinets begin to look good enough at this stage to have trademarks imprinted from decalcomanias

For instance, at one end of the manufacturing extreme, cabinets are dipped when filled and stained, whereas at the other extreme is a painstaking hand rubbing.

Somewhere in between are a host of other operations, some clearly the methods of mass manufacture, others plainly requiring the deft touch of the craftsman.

Dipping, for instance, is what you might expect in mass production. Strangely enough, it is not only quicker and cheaper than hand or spray methods, it is also better, actually providing a better groundwork on which to lay the final finishing tones.

The End Is Quality

Painting schedules have of course been carefully worked out, lacquers carefully selected. There is plenty of drying time—time for the inspectors to get in their work, as it happens—between staining and sealing, between sealing and final lacquer coat, between final coat and hand rubbing. Spray booths, incidentally, are of the modern type in which the spray is directed into a curtain of water which keeps noxious vapors from escaping to outside atmosphere, guards also against the fire hazard.

Quality then at Philco is not so much the inevitable accompaniment that keeps mass production methods from bogging down as it is the result of constant emphasis on the need for it. It is the eternal harping away at the same old tune that gets the desired results.

Photographs by Rittase, courtesy of The Sherwin-Williams Company

What! no conveyor? Not when so much depends upon careful, unhurried preparation for finishing operations

Control Board Tells All

Gives management a quick picture of all it needs to know about the location of orders. Easy to adapt

R. N. VINCENT
Production Manager, Ware Valley Manufacturing Company, Inc.
Ware, Mass.

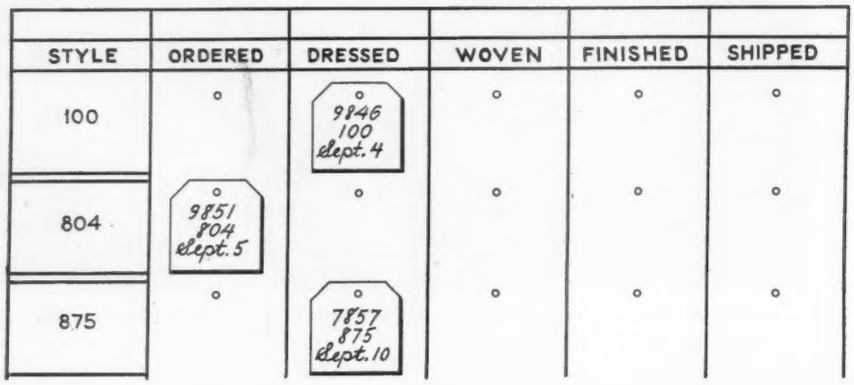


Figure 1. Tickets are moved as actual work progresses from one department to the next

THE production control system I am going to outline has been successfully installed in a number of woolen and worsted mills. It is one that can be used in other textile establishments, or, because it is based upon management principles common to all industry, readily adapted to the specific control problems obtaining in plants of widely different character.

Its principal feature is a control board that is not so very different from others you have seen. The purpose of the system is to control the production of goods, not by *customer* as is the practice of many mill managers, but to follow the process by *style*.

Whether or not pieces in process are ahead of or behind schedule is determined by checking the location of each piece daily at important production centers. The checking points are these five: (1) Orders received; (2) dressing; (3) weaving; (4) finishing; (5) shipping.

As each order is received, a ticket is made out for each piece. Tickets show style number, piece number, and date of shipment. There are hooks on the board, and tickets are placed in the "ordered" column by style number—that is, all tickets bearing the same style number are placed on the same hook; and by delivery dates—that is, the ticket with the earliest date is placed on top, and so on.

Tickets Tell the Story

Each day the production clerk receives a report from each department and moves the tickets from one column to the next as pieces are actually moved from one production center to another (See Figure 1).

From the board it is then possible to make out a list of all pieces that are behind schedule. Copies of the list go to the factory superintendent and department heads. It is thus possible for management to know the exact location of any order at any time, and, more important, whether it is ahead of or behind schedule. Only with that knowledge can delivery dates be met.

Bottle Necks Show Up

One of the necks of the bottle happens to be the dressing department. The daily report from the dressing room overseer will, therefore, show (again see Figure 1) that piece 9846, style 100, and piece 9857, style 875, have been dressed. Tickets are therefore moved into the "dressed" column. On the other hand, nothing has happened to piece 9851, style 804. For some reason it has not been dressed, although the delivery date is five days earlier than that for piece 9857. Something is obviously wrong there and will bear investigation.

So much for the system and the

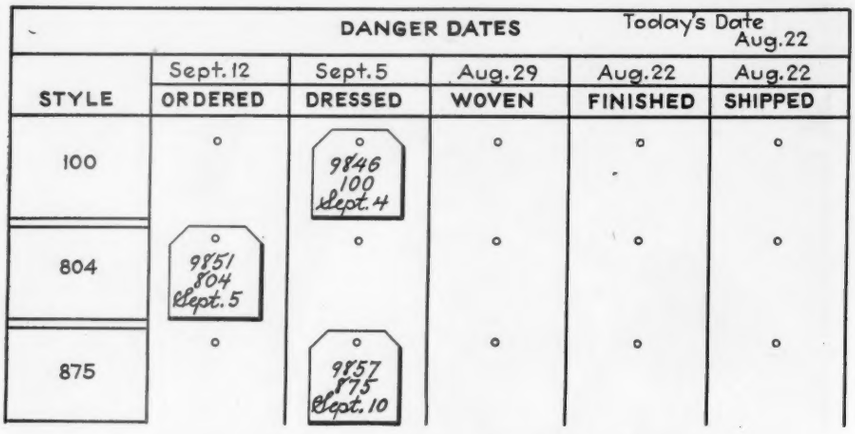


Figure 2. The "danger dates" show at a glance whether an order is ahead of, on, or behind schedule

board in its simplest form. A refinement of the latter is necessary in order that management may know not only when pieces are behind schedule, but also how far behind.

To accomplish this, "danger dates" are placed above the column headings, and in Figure 2 a portion of the board is shown in its final form.

Danger Dates

Danger dates are set to meet the mill's capacity to produce. For illustration, assume that it takes a week to process a piece through each production center. Let us say today is August 22. Then it follows that an order received today can be promised for September 12 delivery. And to meet this promise the piece must be dressed by August 29, woven not later than September 5, and finished by September 12. Today's date is therefore set down in the upper right-hand corner of the board, also in the "finished" and "shipped" columns, and is advanced a week for each of the three preceding production centers.

The board now works like this. If the delivery date on a ticket is the *same* as the danger date, the piece is *on schedule;* if *earlier,* it is *behind* schedule; if *later,* it is *ahead* of schedule.

For instance, it will be seen on referring to Figure 2 that piece 9846, style 100, is scheduled for delivery September 4. That date is *earlier* than the danger date, therefore the piece is a day *behind* schedule. Figure it out for yourself. Today is August 22. If it takes a week to weave and a week to finish, the piece cannot be shipped until September 5.

On the other hand, piece 9857, style 875, calls for September 10, five days *later* than the danger date and hence five days *ahead* of schedule. Again, as it takes a week to weave and a week to finish, the piece will be finished on September 5 and can be shipped five days earlier than promised.

Information at a Glance

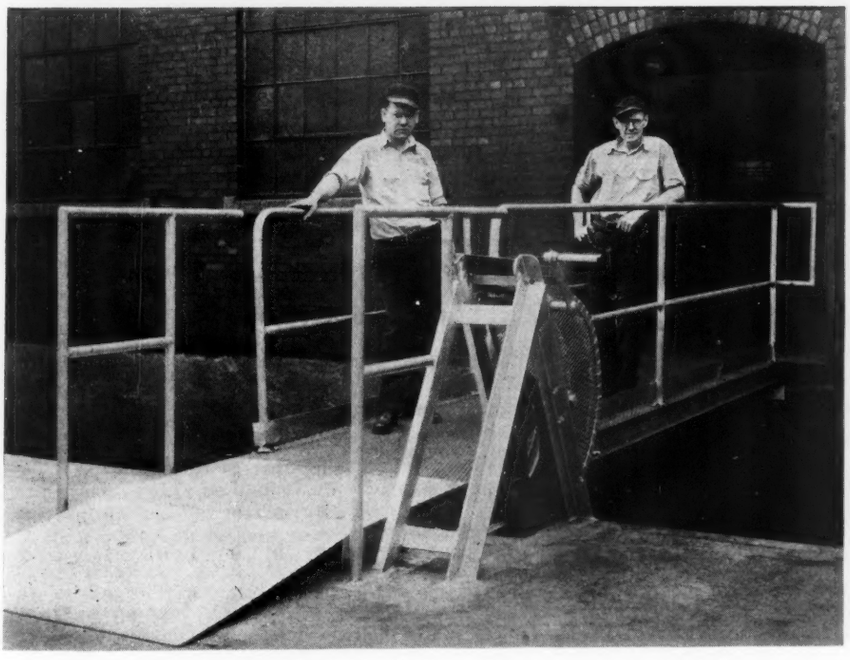
One further refinement of this production board may be made, and has been found to increase its usefulness in that it helps to make the necessary information available at a glance. This refinement consists of using two columns under each production center heading. One of the columns is marked "late" and in it are hung the tickets for pieces that are behind schedule. One quick look tells the management all it needs to know about any order.

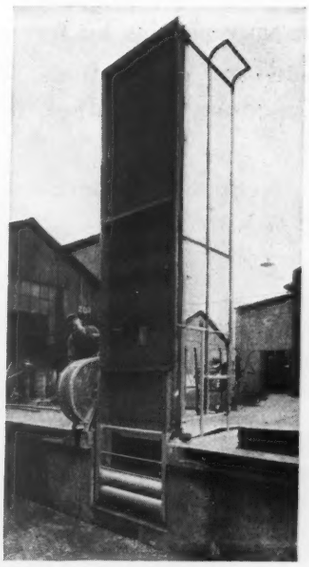
Built an Aluminum Bridge

LOADING platforms mean depressed tracks and often create a problem in safety and convenience since it is neither safe nor convenient to climb down onto the tracks and up the other side in order to cross.

The Aluminum Company of America had this problem at its Arnold, Pa., plant. It used to spot a freight car at the crossing point so men could pass through it to go from the loading platform to the tube mill. Naturally this was not always easy and certainly it was expensive.

So they built a small, hand-operated single-leaf bascule of welded steel and aluminum construction to take care of this pedestrian traffic over the tracks. Aluminum members were used to reduce the dead load and permit easier hand operation.





Although the bridge was intended solely for foot traffic, it will accommodate a truck with a 500-lb. load.

The trunnion and hand-operated lifting mechanism are located on the platform. When cars are to be switched to the siding, the bridge is raised and locked in a vertical position clear of the track.

Counterweighting helps to balance the bridge, but it was found practical to overbalance in the down direction on the free end by 57 pounds and to add a latch at the free end so that two men stepping together on the counterweighted end would not cause the bridge to tip up.

Human Relations Win

Thirty plants, employing 40,000, select the five foreman training objectives they consider most important

A SURVEY made by the University Extension Division of Rutgers University, and whose results are made available by Prof. J. H. Vertrees, indicates that management has gone far in its adaptation of foreman training objectives to the new situation that industry faces.

•

Get Most Votes

1. **Increasing foremen's understanding of men**
2. **Improvement of job training ability**
3. **Better interpretation of company policies by foremen**
4. **Better cooperation with supervisors and other foremen.**
5. **Developing foremen's ability to plan**

•

Questionnaires went to 30 plants with some 40,000 employees. Seventeen of the replies came from the plant managers, most of the others from personnel executives. The questionnaire included sixteen objectives which at least suggested rather specific problems. These problems were divided into three groups as shown in the table.

Each recipient was asked to name the five objectives he considered most important, in order of importance. The columns under "Order of Importance" indicate how many times each objective was placed first, second, etc. "Weighted Score" was obtained by assigning 5 points to first choice, 4 to second, and so on. "Times Named" shows frequency of selection regardless of order of importance.

It is evident that these executives are well aware of the importance of human relations. The first six objectives received 57.7 per cent of the votes and 67 per cent of the weighted score. Of 30 first choices, 25 were in the human relations group, as were 23 of the 30 second choices. If we should properly divide "Planning of work and distribution of workers" (objective No. 7), half of it would fall in the first group of objectives and the contrast would then be even more pronounced.

It is just as true as ever that the final objectives of management are among the last two groups shown in the table. Quality, costs, job studies, etc., are still major goals. It is significant, however, that these managers realize the futility of achieving such ends without giving first attention to job training, personnel policies, cooperation, and other phases of human relations.

New Emphasis

Also, the failure of objectives 10, 15 and 16 to secure greater recognition is not due to the relatively minor importance of equipment, its maintenance, and its hazards. It is due to the realization that getting the most from equipment at least cost requires more than technical ability. It requires the centering of effort upon the training of the leaders whose subordinates run the equipment.

Current Objectives in Foremen Training

	Order of Importance 1st	2nd	3rd	4th	5th	*Weighted Score*	*Times Named*
LEADERSHIP AND PERSONNEL RELATIONS:							
1. Training of workers on the job	8	1	5	0	1	60	15
2. Safety-increasing the intelligence and carefulness of workers in relation to accident hazards	1	6	0	4	2	39	13
3. Interpretation of company policies to workers	9	2	1	0	0	56	12
4. Understanding of men—ability to settle complaints and adjust individual cases of mal-adjustment	4	8	1	4	2	65	19
5. Interest of workers in work and company	1	2	4	2	2	31	11
6. Cooperation with other departments and superiors	2	4	5	4	1	50	16
Total	25	23	16	14	8	301 (67%)	86 (57.7%)
ABILITY TO MANAGE DEPARTMENTS:							
7. Planning of work and distribution of workers	2	2	5	4	2	43	15
8. Uniformity in quality-reduction of substandard products	0	2	2	5	3	27	12
9. Cleanliness and orderliness in department	1	0	0	1	7	14	9
10. Ability to cut down time and cost of maintenance work	0	0	0	0	1	1	1
11. Understanding of the application of pay incentives	0	0	0	1	1	3	2
12. Understanding of costs as related to the entire productive process	0	1	4	2	1	21	8
Total	3	5	11	13	15	109 (24.3%)	47 (31.5%)
ABILITY TO DISCOVER BETTER PRODUCTION METHODS:							
13. Job study for elimination of unnecessary effort and time of worker	1	2	2	0	2	21	7
14. Waste study for conservation of material and supplies	1	0	1	3	3	17	8
15. Equipment study for improvement of machine design, layout, etc.	0	0	0	0	0	0	0
16. Equipment and methods study for elimination of hazards	0	0	0	0	1	1	1
Total	2	2	3	3	6	39 (8.7%)	16 (10.7%)

Note—One company failed to indicate a fifth choice.

Time for Plastics?

The concerns whose products are pictured on this page have decided it is. Haven't you a product for plastics?

Photographs from Toledo Synthetic Products Company

1. "Quacker" (Warren Telechron Company) is guaranteed to get the children off to school in time. Nice thing about molded plastics of the urea type, you can have almost any color you like

2. Even spinach isn't so bad when it's served up in this blue plate," which needn't be blue at all. Advantage of molded plastic ware is that it won't break without serious provocation

3. "On me" (House of Gadgets, Inc.) is a simple version of roulette or something. Base and moving parts are zinc die-castings, need no finishing. Molded case of the one we have is scarlet

4. Salts and peppers, measuring scoops, tumblers (molded by Richardson) mark advance of plastics into the kitchen

5. Gift boxes with re-use value are being stocked by some of the custom molders. These happen to be specially designed for Community silver

Now Look at Layout

There's a new technique born of motion economy. Use it to get your plant ready for 1935 business

ALLAN H. MOGENSEN
Consulting Editor

RECENT articles in this journal have shown that new conceptions of plant layout are indicated in the changes that are being made in some plants. Most of these changes, however, have described the final results and the reasons for the moves. It is therefore the purpose of this series of three articles to show just how to determine if your present layout is satisfactory, analyze present operations, evolve the best possible sequence of necessary operations, make the new layout, if one is justified.

Process Charts

To determine whether or not your present layout is satisfactory, there is no better method than the process chart study. A floor chart is drawn for each one of the major products to be considered in the layout. It is made by following either material or men throughout the entire process. It shows the routine of the object being followed from the beginning of the process to the end, keeping that one object in mind. Wherever a move or a handling of any sort occurs, the distance traveled is shown and summarized at the bottom of the chart.

To simplify chart making, and to help visualize the process, symbols are used. The ones shown in the process chart on the opposite page are those most commonly used of the many developed originally by the late Frank M. Gilbreth. It will be seen in some of the illustrations that combinations of these symbols may be used.

Flow Chart for a Spring

This flow chart was made for a small spring typical of a great many manufactured in a certain plant. Here the material is followed, from its start in the storeroom in coil form through its completion and placement in parts stores awaiting assembly. Alongside the symbols is placed the distance traveled.

The route sheet, operation detail, or operation listing gave the impression of a simple operation. Only six steps were shown. When the process chart was displayed to the plant manager, he was certain that there must have been some mistake. He could not believe that there were actually 59 steps in the manufacture of this minor part, or that it moved a distance of 4,041 feet. It took the flow diagram shown at the bottom of the page to convince him that he was not seeing things.

Before you dismiss this example with the consoling thought that this plant must have been a sorry mess, just make one process chart in full detail of your own product. Changes in volume of business, styles in product, or in products themselves, and in manufacturing methods may all result in conditions such as this, even though at one time an ideal layout existed.

Likewise it may seem that too much detail is shown in the flow charts. Every single step in the movement of the work *must* be shown if the chart is to be of any value. Unnecessary steps cannot be eliminated unless they are first brought to light.

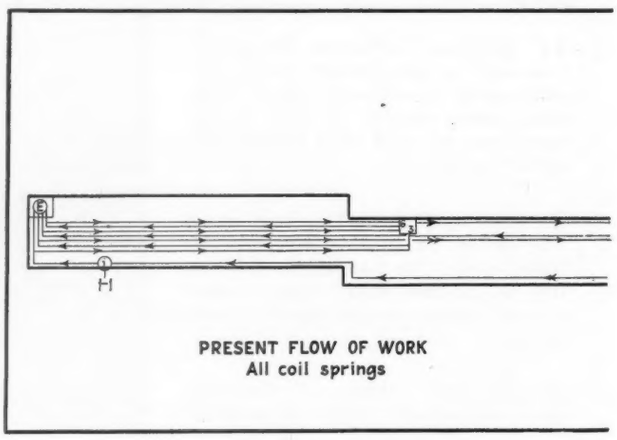
Flow Diagrams

To aid in visualizing the flow of work, flow diagrams laid out to scale are made. Backtracking, which is indicated in the process chart by a note or by excessive travel in the summary, is immediately emphasized by the large number of parallel lines between the inspection department in the center of the long building (see flow diagram) and elevator at upper left corner. Later, pro-

Four Steps You Take

1. **Find out whether your present layout is satisfactory**
2. **Analyze present manufacturing operations**
3. **Work out the best possible sequence of operations that are necessary**
4. **Make the new layout, if one is justified**

This spring, shown big as life, caused all the grief set down in the process chart on the opposite page. Would you believe



PRESENT FLOW OF WORK
All coil springs

PROCESS FLOW CHART
Coil Spring

Operation	Distance
△ Raw stock stores	
(M) To scales	15
(!) Weigh	
(M) To spring job	550
▽ Ahead of operation	
(M) To winding machine	20
(2) Feed into machine	
(3) Wind	
(4) Cut-off (10 ft. length)	
(M) To bench for cut-off	8
(5) Cut-off (1 pc. length)	
(6) Pick up and place in pan	
(M) To bench	15
(7) Grind both ends	
(8) Place for transportation	10
Surplus Raw Stock	
(M) To raw stock room	550
(9) Weigh	
(10) Replace balance of material	15
▽ Raw stock stores	
▽ Wait for trucking	
(11) Load on electric truck	
(K) To elevator	60
(E) Up-(1) floor	15
(K) To inspection room	200
(12) Unload	
(M) To inspection bench	8
□ (13) Inspect	
(M) Place for transportation	8
▽ Wait for trucking	
(14) Load on electric truck	
(K) To elevator	200
(E) Up-(1) floor	15
(K) To heat treat	600
(15) Unload	
(M) To bench	25
(16) Place in wire basket	
(M) To niter tank	15
(17) Heat	
(18) Quench	
(19) Dip in oil	8
(M) To bench	7
(20) Empty into pan	
(M) Place for transportation	25
▽ Wait for trucking	
(21) Place on electric truck	
(K) To inspection room	70
(22) Unload	
(M) To bench	18
□ (23) Inspect	
(M) Place for transportation	18
▽ Wait for electric truck	
(24) Load on truck	
(K) To elevator	680
(E) Down (1) floor	15
(K) To inspection room	200
(25) Unload	
(M) To bench	8
(26) Place on rods	
▽ Set	
(27) Remove from rod, place in pan	
(M) Place for transportation	8
▽ Wait for trucking	
(28) Load on electric truck	
(K) To elevator	200
(E) Up-(1) floor	15
(K) To P.S.	440
(29) Unload	
▽ Part stores	
	4,041 Ft.

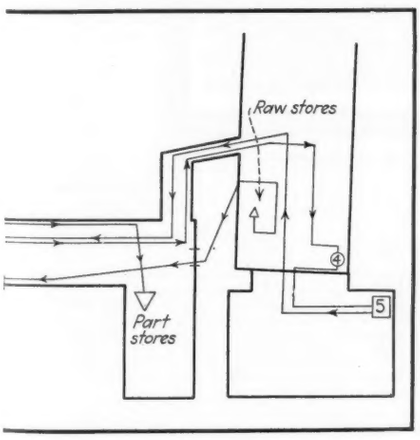
SUMMARY

Number of Operations	29
Number of movements by man	16
Number of movements by elevator	4
Number of movements by electric truck	5
Number of waits for trucking	5
	59

Total distance traveled - 4,041 feet

○ Denotes an operation
○ Denotes a transportation
▽ Denotes a temporary storage
▽ Denotes a permanent storage
□ Denotes an inspection

there were 59 steps in its manufacture, that it traveled 4,041 feet? The flow diagram below proves that you aren't seeing things



posed changes can be sketched in, and the best rearrangement secured.

Next Month

Next month's article will show how the process chart is used in arriving at the new method, what questions should be asked of each step, and how the new layout diagram is made. Further discussion of the relation of motion study to plant layout will be found in earlier articles. The reader's attention is especially directed to "See what motion study did to plant layout," *F.&I.M.*, Dec., 1931, p. 797; "Plant layout cashes in on motion economy," *F.M.&M.*, March, 1934, p. 114.

Another Industry Fights Chiseling

IF YOUR industry still has chiselers in its midst—and apparently many an industry does—you may take a page out of the electric service shops' book. Their attack on the price-cutting gentry within their own industry is one that any industry can adapt.

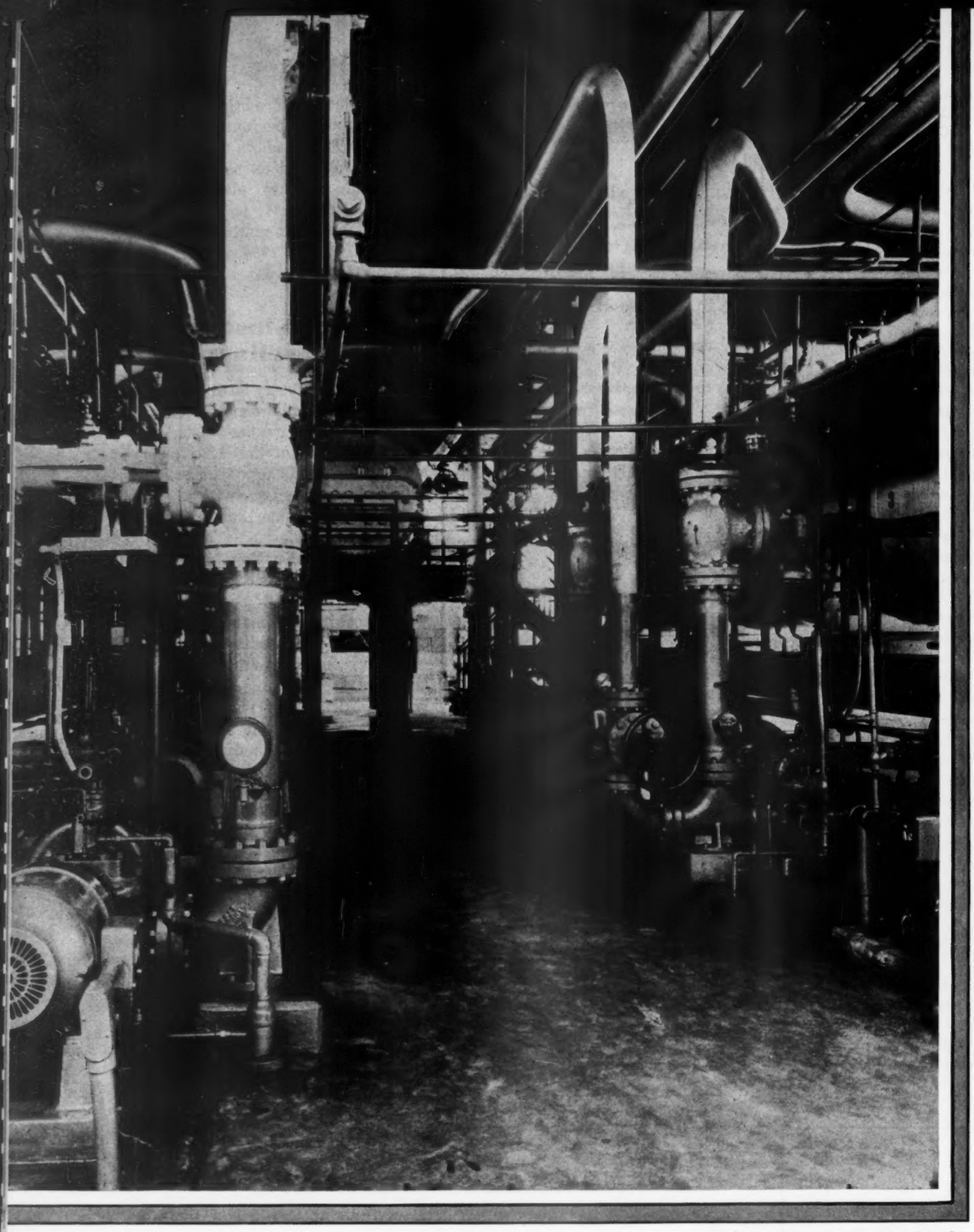
Briefly, the situation in the electrical service industry was this. Aided and abetted by low-quality workmanship and materials, and—still worse—by complete ignorance of costing methods and facts, certain chiselers were bidding so low on electrical work that it was almost impossible for a reliable shop with an honest estimate to land an order.

The agency through which the industry is beginning to act is the National Industrial Service Association, with a nationwide membership of 700 shops.

NISA's plan of attack is to develop specifications for "certified" workmanship and materials. For example, *Specifications for Certified Motor and Generator Rewinding* have already been completed and cover such items as stripping; slot, coil, and phase insulation; windings; impregnating and baking; and testing.

With these specifications in force, a member can point out to his customer just what his figures cover in the way of workmanship, parts, insulation, and tests, and can emphasize the fact that where a great difference in bids occurs it might be wise to ask the suspiciously low bidder to produce *his* specifications.

Thus, the first-class shop can rest assured that, if it is conducting its business efficiently, it will not be underbid drastically by anyone doing comparable work; and the purchaser has at his command a means of comparison which will enable him to make a rational decision.



Extraction unit, Socony-Vacuum Oil Company, Inc.

Plant operation may be largely automatic, as in this new million-dollar refinery; plant maintenance never is. Miles of piping indicate the magnitude of the maintenance job, testify to its importance in plant operation

To Set Up Standard Costs

No radical departure from established accounting theory is needed. Standard costs simply make implicit comparisons explicit

H. P. DUTTON
Associate Editor

"WE WERE on a 47-hour cost basis last week." Thus a department head in a large steel-fabricating plant commented on a reduction from 60 to 47 labor hours per ton of product. There was a good bonus for everybody in the showing. Costs in this plant had been taken out of the office and put to work in the factory.

Modern standard costs represent no very radical departure from established accounting theory. They are chiefly significant as an improvement in methods of supervision and control.

There are cases where practically all the benefits of control by comparison with standards may be obtained without a formal standard cost system. Comparisons are implicit in any cost system worth the name. But it is of value to make implicit comparisons explicit and easy to use. Hence the adoption of the standard cost idea, in forms modified to suit the individual case, is proceeding rapidly among progressive companies.

The cost of any product is obtained by adding to the material cost the direct and burden costs of the various processes through which the product passes. A cost card of this type, used by a large electrical manufacturer, for product or parts costs, is shown in Figure 1.

A standard cost system may resemble any of the common plans of costing except for one essential difference. The costs shown on the process or product cost sheets will be standard costs, set on the basis of experience and engineering studies. Actual costs will be used only for comparison and for the determination of variances from standard.

As a consequence of this method of costing, the work-in-process inventory, which is represented by the aggregate of process material charges, will be carried at standard cost rather than actual. Really, such an estimate of inventory cost, based on normal or average conditions, is a truer measure of value than the usual historical cost, which may be affected by violent fluctuations in volume or other conditions that cannot be recouped through the sale of the inventory.

An executive cannot see everything that goes on in a busy plant. He does not need to, if he can disregard the things that go according to plan and concentrate on the exceptions—the failures as well as the super-standard performances. A good standard cost system does just this. It defines standards in terms that any routine clerk or inspector can be trusted to apply, shunts the standard performance through the routine, and leaves the executive free to concentrate on points of trouble, with time left over to plan

The procedure by which variances from standard are disposed of is shown in Figure 2.

Assume for the moment that the factory has a complete set of records of standard costs of materials. As part of this set of standards, the purchasing department will have a card record showing the standard price of the material, say copper wire, and the standard quantity used on any product.

The Variance Account

Let us follow a purchase of raw material through the records. The vendor's account payable will be

STANDARD FACTORY COST

Piece No. 347-A
Drg. No. 347-A
Cost Per
Description Relay Coil
Route 10-14-27-Stores

STANDARD COST To be Used for Pricing		COIL COVERING	CORRECTED COST Not to be Used for Pricing
Piece Nos.	347-A-1, 347-A-2,3.	Labor	Piece Nos.
Raw Material	.0853	Burden	Raw Material
Labor	.20		Labor
Burden	.355	Plating	Burden
Total	.6403		Total

Remarks:

Based on Lots of 10,000

Order No.	Amount Made	Date Finished	ACTUAL LOT COST Piece Nos.	Raw Material	Labor	Burden	Total
Standard	10,000	9/20/33	347-A-1,2,3	.0853	.20	.355	.6403
30116	10,000	8/14/34	"	.077	.32	.355	.652
31444							

Figure 1. Standard factory cost card used by an electrical manufacturer. Affords comparison of actual costs with standard. Space on the other side for the details of standard material and labor costs

REPORT OF PRICING AND MANUFACTURING VARIANCES MONTH OF _____ 193____

	MONTH						CUMULATIVE					
	ALL DEPARTMENTS COMBINED			VARIANCES BY DEPARTMENTS			ALL DEPARTMENTS COMBINED			VARIANCES BY DEPARTMENTS		
	Budget or Standard	Actual	Variance (Red. if unfavorable)	A Plant	B Plant	C Plant	Budget or Standard	Actual	Variance (Red. if unfavorable)	A Plant	B Plant	C Plant
MATERIAL PRICING VARIANCE												
Material used, at standard cost and actual												
MATERIAL USAGE VARIANCE												
Material required by specifications												
Material used												
Total, including material waste												
Less, material content of waste allowance and actual												
Net material usage variance												
WASTE VARIANCE												
Standard allowance for production accomplished and actual												
SECONDS VARIANCE												
Standard allowance for production accomplished and actual												
DIRECT LABOR VARIANCE												
Labor required by specifications												
Labor paid												
Direct labor variance												
MANUFACTURING BURDEN VARIANCE												
Budgeted expenses												
Actual expenses												
Variance due to expense fluctuation												
Budgeted expense absorption												
Expenses actually absorbed in production costs												
Variance due to production fluctuation												
Total m'f'g. burden variance or unabsorbed burden (Difference between expenses absorbed and actual expenses)												
TOTAL VARIANCES												

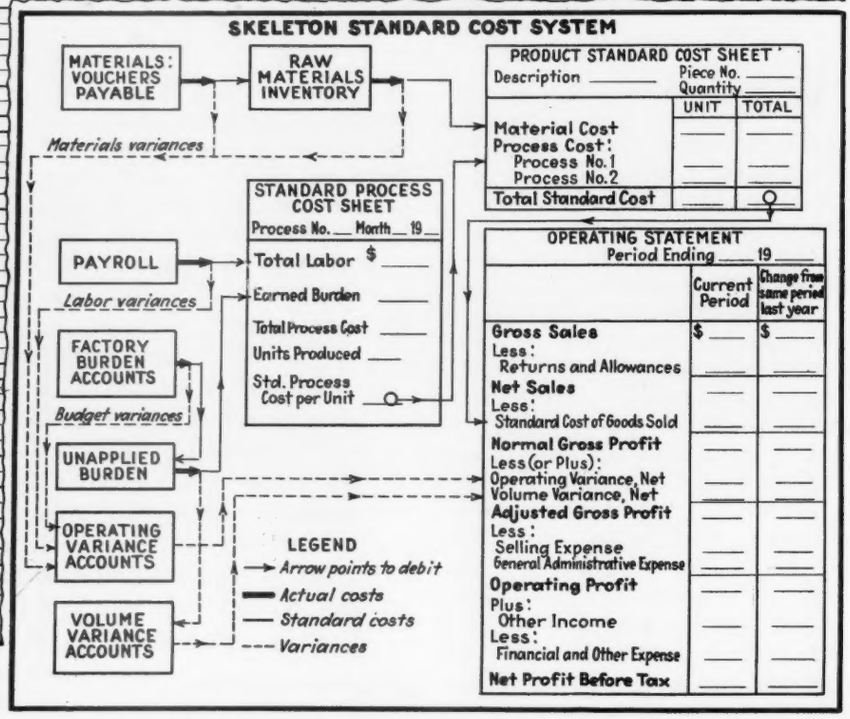


Figure 2. A skeleton standard cost system that shows how variances from standard are disposed of. Adapted from a diagram of F. Richmond Fletcher in "Standards as a Means of Reducing Cost," Yearbook of the National Association of Cost Accountants, 1922

Figure 3. (At top) Variance report used by a textile mill presents a summary of operating results in terms of conformity to standard that clearly indicate when attention is needed

credited with the actual or invoiced cost. Raw material stores will be charged with the actual quantity of wire received, but at the standard price. If there is a difference between actual and standard value, it will be carried as a charge or credit to a material-price *variance account.*

On the withdrawal of the material for use on a job, raw material inventory will be credited with the actual quantity delivered. The product cost record, however, or work-in-process account, will be charged for standard quantity. Again the variance, if any, will go to an appropriate variance account.

The same process of crediting payroll at actual cost and charging the job at standard, carrying any variances to a suitable labor variance account, will take care of labor charges.

To Handle Burden

How are burden charges handled with a standard cost system? Supplies, materials, wages and salaries are no different as burden than as direct costs. The need for these expenditures can be analyzed by the usual methods. Once these requirements are set up as budget standards, they become a basis for estimate and for measuring performance, exactly as with the standards for direct expenditure.

Burden expenses should be allocated on a responsibility basis. This will mean that the first charge for practically all burden expenses will go to a departmental cost sheet, such as that for the engineering or the inspection department. Taxes, insurance, and the like will be allocated to departments on the basis of values or service. So far as possible the expenses of indirect departments such as general factory administrative, maintenance, or inspection will then be pro-rated to the operating departments or production centers on the basis of use or service.

In most companies the ratio of burden expenses to direct labor, the old familiar camel that bears the burden of all other departments, is constantly increasing. In many factories labor may constitute 10 per cent or less of the total cost. Without the separate estimate and analysis of burden expenses here described, unnoticed and unsegregated expenses may easily mount until they break the camel's back. Recognizing the decreasing significance of direct labor, many accountants now combine direct labor and all other expenses allowable to a department, machine, or other production center, into a single rate or cost per hour or per unit.

Fixed expenses, or those beyond the control of the department head,

(Continued on advertising page 46)

50 Foot-Candles

Are not a bit too much light at drafting boards. These photographs show two A-1 lighting jobs

BARBER Asphalt Company, Buffalo, needed a new drafting room, turned an old parts storeroom into one with a little beaverboard and a new lighting system.

The new room, 36 by 48 feet, is shown in the lower photograph. Illumination is from eight 750-watt, totally indirect reflectors mounted 9 feet high in two rows of four each. Reflectors are 12 feet, rows 24 feet, apart. Ceiling and walls are painted white to increase the lighting intensity.

Supplementary lighting is provided at the tracing files by four white glass, 200-watt units of the direct-lighting type.

The other drafting room is in the Glass Manufacturing Department of the Incandescent Lamp Department, General Electric Company, Cleveland. Units of the totally indirect type are spaced on 10-ft. centers, are equipped with 1,000-watt lamps, produce 50 foot-candles of light.

Plant Geared to Sales

Everybody happy. Sales gets what it wants sooner than it used to. The factory's job is easier. Costs have shrunk

E. F. ROBERTS
Vice-President of Manufacturing
Packard Motor Car Company, Detroit

AS EVERY manufacturer knows who has attempted quantity production of a large and complex article, with infinite possibilities of variations and "specials," the task has its inherent difficulties. Everywhere along the way, from purchase orders to the final manufacturing process, there exists a crying need for pre-planning and scheduling, so that the successive processes may proceed without any hitch. Consequently production schedules must be worked out well in advance, and held to.

Yet this is not the safest of procedures, since sales cannot be forecast too precisely, either as to totals or (far more important) as to details. And if the schedule is worked out in such fashion that it must be held to rigidly, all manner of losses are not only possible but likely.

Let's look at these generalities in specific terms of what it all means in manufacturing Packard automobiles. Our quantitative production schedule must be worked out two or three months ahead, to keep incoming supplies and our own parts production departments in step with the needs of all those sections which eventually flow together at the final assembly line. And it is not an undue responsibility for our management to have to determine, say, that during November the factory shall make 1,000 automobiles, of which the greatest number will be Standard Eights, a smaller number De Luxe Eights and Twelves.

If Sales Pick Up

If sales for November should pick up unexpectedly, we might then find ourselves a few days behind with deliveries, which would necessitate juggling finished cars from here to there—but neither the expense nor the trouble would be important in relation to the fact of increased volume. If November sales should be less than estimated, and we therefore find our production schedule running ahead of deliveries, we have the choice of shutting down for a few days or—more probably—merely accepting as inescapable that inventory will swell until subsequent production schedules can take care of the excess.

Our total monthly production schedule of Packards is therefore no overwhelming problem. But when it comes to detailing the total estimated cars for any one month into so many black, so many blue, so many maroon, so many dark green, so many in two grays, we admit we are not so bright.

We might even be able to guess rather accurately on colors. But there are infinite variations possible. Each month we sell a good many cars for export. How can we hope to figure out the color schemes and body styles which will meet the fancies of an English duke, a French banker, an Argentine rancher, and an Indian maharajah?

Of necessity the sales department must tell the factory what to make, forecast as far ahead as possible, work closely with production executives. The factory must be guided daily by actual sales.

The Element of Uncertainty

Until recently, the sales department ordered daily schedules by body type and equipment. If the day's prorated production schedule called for 35 automobiles, and the day's orders totaled 25, then the sales department issued orders for 10 cars which it believed would probably be in demand in the immediate future. These cars, which must be manufactured without definite orders from distributers, are known as

Instead of ordering each car with complete specifications at the time it starts in the factory, the sales department gives detailed orders on each set of operations only at the time these specifications are needed. Mechanical hub of the system is the teletypewriter

"sales department cars." They represent the element of uncertainty which must necessarily be injected to make ours a production plant rather than a job shop. Sales department cars enter prominently into this article, so please keep them in mind.

Packard distributers, like all merchants, insist on working down their inventories at the month-end, and then order liberally the stock which they expect to sell before the next month-end. In consequence, our orders show a big bulge immediately after the first of the month, then dwindle away.

This had its complications in the sales department. The flood of first-of-the-month orders often swamped the machinery set up for typing and duplicating factory orders. Orders came to the factory out of rotation; rush orders got sidetracked; there were all the inherent troubles of batch production.

Artistic Temperament?

In the plant there were likewise problems arising from human nature. The man in a paint booth probably spent the morning painting up all his black work, and hung his black gun for the day. After lunch he painted all his blues, then went on to maroons, greens, and so forth, a color at a time.

The same sort of thing happened everywhere. A foreman in a parts assembly department ran through all of his day's parts for one type of car before he shifted over to another type, even though it involved no change in tools, jigs, or fixtures. In consequence, there were—and we saw no harm in this, because we were used to it—excess supplies of this or that lying around for a few days, while we knew from sad experience that every so often we should have to shut down some department because the parts which came from preceding sections would be for different models, colors, or what not.

I do not wish to give the impression that everything was at sixes and sevens. Our manufacturing was recognized in our industry as efficient; it was merely that we, and other manufacturers with comparable problems, took for granted that this sort of thing was necessary.

All of this led to complications in relations with distributers, dealers, and customers. We could promise, with a 99 to 1 chance of keeping our promise, that a given car would be produced during the first half of a week, ready for delivery. But we could not tell a customer that he would be able to take delivery on Tuesday afternoon somewhere near 2:30 o'clock; and if the customer appeared on Tuesday afternoon, the chances were about even that we could deliver the car then, or we would have to tell him to come around tomorrow—which was better for the Detroit hotel business than for our goodwill.

Final instructions are received at the assembly line as needed. Flexibility is retained up to the last possible minute

Robbing Peter

Likewise, because each car was ordered by the name of the distributer (unless it was a sales department car) and the dealer notified that the order had been placed in the factory, we ran into unpredictable difficulties. Let's assume that the head of the New York branch ordered a particular car for stock, because he thought his trade would buy it. Suddenly there came a telephone call from Fort Wayne, Indiana. A customer there wanted a car of thus-and-so specifications—which were identical with those of the New York car in process, or so close that an amendment to the factory order would meet these new requirements. But in order to make the Fort Wayne sale the dealer had to deliver on a specified date, too early for us to start a new order; the customer, let us say, was starting for a winter in California, and unless he could get his new car by next Thursday, the deal was off.

No Details Till Needed

Of course we promised, diverted the New York stock order to the Fort Wayne customer order, and actually got this extra consumer sale. But presently the New York branch became aware that its car, ordered for stock, was not coming through as soon as expected; and human nature being what it is, New York howled to high Heaven.

The procedure that has taken the place of this old-established method is predicated on a simple idea. Instead of ordering each car with complete specifications at the time it starts at the earliest process, the sales department gives its detailed orders on each set of operations only these specifications are needed.

For instance, on the original order the sales department may place 8 sedans, 6 club sedans, and so forth, up to the day's total. These jobs go through, but their eventual destination is no more assured than is that of a car of California berries which are shipped eastward and are rolling while the shipper undertakes to find which city will offer the best market for them. We in the plant know, for example, that so many cars will be sedans, so many club sedans. But we do not know—and usually neither does the sales department—whether they will turn out black or blue or gray. That will be settled when it must be.

The mechanical nub of the new system is the teletypewriter. We have one in the sales department, one in traffic and shipping, one in factory department LF, the trim line. The sales department issues by noon jobs to be started next day in framing, the first car-building step. The order shows car serial number, color, five or six wheels, right- or

left-hand drive, trim (if special), and scheduled date.

To give some slack to care for rush orders, approximately 25 bodies are stored in the prime coat without final color—which is a smaller number of bodies than were previously standing around because of failure of synchronization of the production schedule. The sales department can order out one of these bodies when it needs to, and ordinarily at the same time starts a new body for this bank, to keep up the reserve.

It is the duty of the manufacturing department to hold strictly to the order in which the sales department instructions come down. If a black body is followed by a blue, a black, a red, another black—then the man in the paint booth turns out these bodies in exactly this order. The slack has been taken out. Parts no longer stand around awaiting the time when, some time today or tomorrow, the rest of the job may be along. It is all synchronized.

When the LF (trim line) teletypewriter operator receives an o.k.'d finished body, he instantly notifies the sales department. Sales department immediately transmits to the LF and traffic teletypewriters the detailed specifications of the car as to accessories, special chassis equipment, export equipment, driveaway, destination, and shipment.

Few Last-Minute Changes

The responsibility is squarely on the sales department to make any changes in specifications prior to issuing orders. After this point, changes are sent to the traffic department teletypewriter for transmission to the proper points in the plant. But because of this routine, very few last-minute changes are ordered. A few sold cars have to be started in the framing department, of course, but most sold cars are started in the trim line, on the first body of proper type and color to come along. You observe by now that the customer, instead of having to wait sixteen working days, is many days closer to his car.

Let's go back to the sales department cars previously discussed. Under the present routine, most cars start out as sales department cars, but by the time they get to the trim line, most of them are sold cars, being completed to definite specifications of distributer, dealer, or customer.

Flexibility to the Last

The essence of this new plan is that flexibility is retained in the production schedule up to the last possible minute—and I don't mean the last possible hour, but the last possible minute. Consequently the number of changes and amendments is reduced: First, because these changes are made in the sales department before they reach the factory; second, and quite as important, because the manufacturing operation takes place very soon indeed after the plant receives the order, and there is therefore little opportunity for anybody to change his mind.

Instead of ordering each car with complete specifications at the very outset, Packard's sales department issues detailed instructions only as detailed instructions are needed

Notice also that the distributer is not notified. The reason, you see, is that his order (unless it is for something very unusual) now does not start at the very beginning, but instead starts out as a semi-finished product at the trim line. There are fewer intervening days during which the Fort Wayne customer can "rob" the New York branch's stock order. Likewise, since it takes us a smaller number of days than previously to manufacture exactly what the Fort Wayne customer wants, the chances are we can definitely promise it to him without touching the New York stock job—and keep our promise.

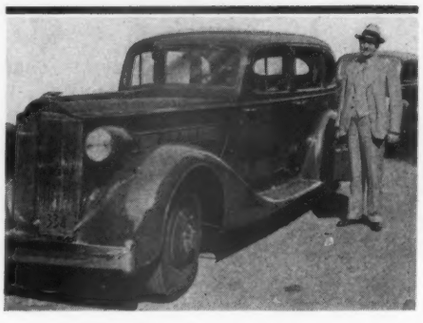
Actually, on this new set-up we can tell a man who wants to drive away his car, "Come over and it will be ready at 9:45 tomorrow morning." When he arrives, the car is either ready for him or it will be within 15 minutes.

If space permitted, any number of improvements could be listed as growing out of this change in procedure. The number of "sales department cars" which actually reach completion unsold has shrunk—there are only about 25 of them around the plant today, as contrasted with several hundred a year ago. Delays in getting shipping documents to distributers ahead of shipments—something that used to occur frequently over a Friday or Monday holiday—have been eliminated. Supplies of finished and semi-finished goods and parts lying around the plant for one reason or another have been decreased by a percentage so great I hesitate to give it lest it lead to the false impression that we were pretty sloppy under the old plan. Everywhere along the line things have been tightened up and oiled. The entire production process flows more smoothly, costs have shrunk, customers are better satisfied.

And Now the Cost

One more point, the cost of doing all this by teletypewriter. The rental of the machines costs us less than $150 a month. That was more than made up by the transfer of the two men previously referred to, who spent their days scurrying around the factory looking up the status of orders and getting amendments to the places where they could not be lost track of or overlooked. There has been a substantial clerical saving in the sales department, since one teletype operator—she is one of the former typists—handles work that previously kept three girls busy; and the cost of filing, stationery expense, and such incidentals has fallen away to a shadow. All of which is unimportant in comparison with the major production results of the system, but worth knowing when the new plan had to be sold to the folks who control expense.

Packard can say to the customer who wants to drive away his car, "Come over at 9:45 tomorrow morning"—and have it ready



More Shift Schedules

3. 8-Hour Day, 36-Hour Week

THIS is the last of three schedules illustrating how one concern has met the problem of adapting working turns to the shorter work weeks that have been a major feature of the New Deal.

All three have been published in the thought that they may help plant operating men work out their own schedules. The first schedule—for the 8-hour day, 40-hour week—appeared in October, page 457; the second—for the 6-hour day, 36-hour week—in November, page 492. Prior to that—to give you the complete picture of what *Factory* has published on this special problem of management—a somewhat different type of schedule for an 8-hour day, 40-hour week was shown. See September, page 386.

To help you adapt your working schedules to shorter work weeks and still give everyone in the plant a fair break

●

All Men Are Equal

Management's first care in making up shift schedules is to see that all men are treated alike, that "days off" are equably distributed.

That requirement has been rigidly observed here as in each of the schedules previously shown. Each man alternates two and three days off per week. Note, too, that this "goes" for shift breakers as well as for regular workers.

It will look at first blush as though the first three operators on Job No. 1 get a better break than the fourth in the matter of week-ends off—assuming, incidentally, that week-ends are more to be desired than week days. Actually it does not matter whether they are or not, for the injustice, if any, washes out over the complete cycle, which is 42 weeks for this particular set-up.

This month, as last, it has been impracticable to show the complete schedule for the entire cycle. That would require six sheets like the one illustrated. Enough has been shown, however, to make it possible for the interested reader to project the balance.

The cycle of progressive days off repeats after the first week; after 42 weeks, cycles of shift changes and days off repeat simultaneously.

Again, as last month, three jobs only are required to make things come out even. Of course any one of these schedules may be applied to any number of jobs, but unless the number of jobs is an even multiple of the number covered by the schedule, one shift breaker will be engaged only part time.

Employees Like Them

One point in connection with these shift schedules has not been emphasized as strongly as it ought to be. It is the very important point that employees like them. Not only are days off equitably distributed among the working personnel, but each man knows weeks in advance, if he's interested, just what those days will be. Thus employees are able to plan ahead, and the more planning they do, the more is it likely that they will use their newfound leisure time to good advantage.

Further explanation of the principles involved in these shift plans may be found in the text that accompanied the other schedules.

36-HOUR WEEK—SHIFT SCHEDULE—8-HOUR SHIFTS

Schedule repeated after 42 weeks

Operator		Wk. End. 12/1 S M T W T F S	Wk. End. 12/8 S M T W T F S	Wk. End. 12/15 S M T W T F S	Wk. End. 12/22 S M T W T F S	Wk. End. 12/29 S M T W T F S	Wk. End. 1/5 S M T W T F S	Wk. End. 1/12 S M T W T F S
Smith	Job. No. 1	x x x 1 1 1 1	1 x x 2 2 2 2	2 x x x 3 3 3	3 3 x x 1 1 1	1 1 x x x 2 2	2 2 2 x x 3 3	3 3 3 x x x 1
Brown		1 1 1 x x 2 2	2 2 2 x x x 3	3 3 3 3 x x 1	1 1 1 1 x x x	2 2 2 2 2 x x	x 3 3 3 3 x x	x 1 1 1 1 1 x
Robinson		x 2 2 2 2 x x	x 3 3 3 3 3 x	x x 1 1 1 1 x	x x 2 2 2 2 2	x x x 3 3 3 3	3 x x 1 1 1 1	1 x x x 2 2 2
Jones		2 x x 3 3 3 3	3 x x x 1 1 1	1 1 x x 2 2 2	2 2 x x x 3 3	3 3 3 x x 1 1	1 1 1 x x x 2	2 2 2 2 x x 3
		● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●
Breaker		3 3 3 x x x 1	1 1 1 1 x x 2	2 2 2 2 x x x	3 3 3 3 3 x x	x 1 1 1 1 x x	x 2 2 2 2 2 x	x x 3 3 3 3 x
		●	● ●	●	● ●	●	● ●	●
		x 1 1 1 1 1 x	x x 2 2 2 2 x	x x 3 3 3 3 3	x x x 1 1 1 1	1 x x 2 2 2 2	2 x x x 3 3 3	3 3 x x 1 1 1
		1 x x x 2 2 2	2 2 x x 3 3 3	3 3 x x x 1 1	1 1 1 x x 2 2	2 2 2 x x x 3	3 3 3 3 x x 1	1 1 1 1 x x x
	Job. No. 2	2 2 2 2 x x 3	3 3 3 3 x x x	1 1 1 1 1 x x	x 2 2 2 2 x x	x 3 3 3 3 3 x	x x 1 1 1 1 x	x x 2 2 2 2 2
		x x 3 3 3 3 x	x x 1 1 1 1 1	x x x 2 2 2 2	2 x x 3 3 3 3	3 x x x 1 1 1	1 1 x x 2 2 2	2 2 x x x 2 3
		● ●	●	● ●	●	● ●	●	● ●
Breaker		3 3 x x 1 1 1	1 1 x x x 2 2	2 2 2 x x 3 3	3 3 3 x x x 1	1 1 1 1 x x 2	2 2 2 2 x x x	3 3 3 3 3 x
		● ● ●	● ●	● ●	● ●	● ●	● ● ●	● ● ●
		1 1 1 1 x x x	2 2 2 2 2 x x	x 3 3 3 3 x x	x 1 1 1 1 1 x	x x 2 2 2 2 x	x x 3 3 3 3 3	x x x 1 1 1 1
		x x 2 2 2 2 2	x x x 3 3 3 3	3 x x 1 1 1 1	1 x x x 2 2 2	2 2 x x 3 3 3	3 3 x x x 1 1	1 1 1 x x 2 2
	Job. No. 3	2 2 x x x 3 3	3 3 3 x x 1 1	1 1 1 x x x 2	2 2 2 2 x x 3	3 3 3 3 x x x	1 1 1 1 1 x x	x 2 2 2 2 x x
		3 3 3 3 3 x x	x 1 1 1 1 x x	x 2 2 2 2 2 x	x x 3 3 3 3 x	x x 1 1 1 1 1	x x x 2 2 2 2	2 x x 3 3 3 3

Legend: x—days off.
●—dots over and under the Shift Breaker's "days on" indicate the upper or lower job he is to cover.

1—1st Shift—12 p.m. to 8 a.m.
2—2nd " — 8 p.m. " 4 p.m.
3—3rd " — 4 p.m. " 12 p.m.

You Want to Know

. . . and the editors will gladly tell you . . . more about the things mentioned on this page

Built-on sorter light, pedal operated, simplifies the checking of punch cards after they've been machine sorted. The operator has only to hold a bunch of cards against the light source to make sure the holes line up and that cards are all of the same classification

• PROTECTIVE COATING, new, withstands action of caustic solutions at elevated temperatures, has been used successfully on brine tanks, resists acids.

• SEVENTY-FIVE companies contributed to "Product Development" their methods and procedures in developing new products or perfecting old ones. This report may be had for the asking.

• VENTILATING FAN, for plant hot spots, is mounted on wheels, works where it's wanted.

• PAMPHLET for distribution to plant executives, also older and more thoughtful workmen — "A Background for Labor Relations."

• SEEMS to be "paint month." There's a new booklet on synthetic resins that should be valuable to anyone who has a troublesome finishing or maintenance problem.

• LONGER PROTECTION, smooth and brilliant finish, are claimed by the makers of a new "flexible" aluminum paint.

• PENETRATING PRIMER kills rust, enables you to paint right over it with astonishing results.

• AFTER IT HAS SET, it cannot burn. That's what they're saying of a new aluminum paint. It stands up to 200 deg. F. without discoloration, can be applied to hot or cold surfaces.

• FOR YOUR DATA BOOK, tables that give weights per lineal foot of length for all sizes of hot finished and cold drawn tubing up to 10¾ in. outside diameter and 1⅝ in. wall thickness. Free.

• SWELLEST molded box of the month, we think, is the one that's built around a famous maker's micrometer caliper.

• FOR WATCHMEN, a new 5-cell focusing flashlight that can be increased to a 10-cell "mile" range searchlight by screwing on another section.

• BRICKS, any shape, any color—also bricks so light they float, so tractable they can be sawed, yet so strong they can be used for building—are being made by a Scottish firm from shale.

• GOOD NEWS for manufacturers of laboratory equipment and other users of tantalum. A Chicago concern has perfected a method of welding this rare metal that will greatly increase its usefulness.

• WANT TO PREVENT occupational dermatitis? There's a handy kit that contains a whole series of protective creams, covering requirements of most problems.

• PLUG IN a new humidifier anywhere in your office. Uses about as much current as a 40-watt lamp.

• REFRIGERATED BAG for perishable products contains pockets for dry ice; can be folded, baled, and returned to plant.

• LOOKS LIKE a bolt, drives like a nail—a new one-piece expansion bolt. Drive it home, it's anchored.

• DRAINING drums and barrels is a one-man job with a new tilting and lifting rack.

• RACKS of welded steel construction will help you solve any box stacking problem.

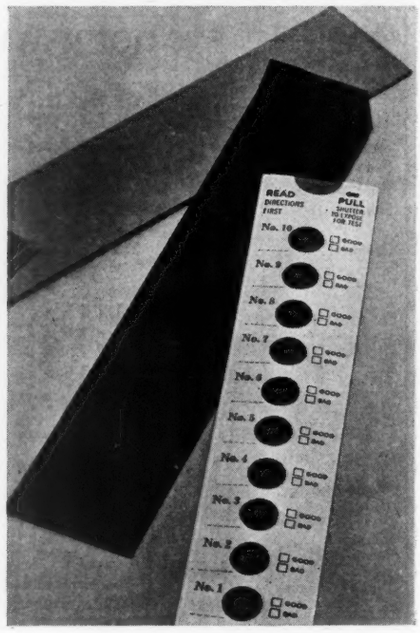
• SUCTION HOSE, recently developed, is lighter, stronger, more flexible. Quickly restored to shape if accidentally crushed. Easily connected to standard couplings, requires no soft ends.

• TO FILL a new type of grease gun, the operator merely slips a 1-lb. factory-loaded cartridge into the barrel.

• MENDING and electric tape, new, is 90 per cent pure rubber, meets building code specifications.

• PRIMER, fifth edition and free, contains 64 pages of facts about sheet iron, including gage tables and glossary.

This light indicator estimates adequacy of light by exposing sensitive film. If after 2½ minutes the film is darker than the protecting envelope, the lighting is good



Aluminum and Labor Agree

Text of agreement by and between Aluminum Company of America and its employees

WHEREAS, the Company is desirous of improving and clarifying its relationship with its employees.

NOW, THEREFORE, the Company hereby covenants with its employees, with the intention of being legally bound hereby, as follows:

I. The Company recognizes and accepts the principles of collective bargaining as provided for in Section 7(a) of the National Industrial Recovery Act, and is at all times willing to meet any of its employees or representatives of any of its employees for the purpose of discussing wages, hours and working conditions, with the object of reaching a satisfactory understanding.

Closed Shop Not Involved

II. The Closed-Shop is not involved in this Agreement. No contract, or agreement, shall be entered into between the Company and any employee or group of employees or their representative or representatives that will, in any way, conflict with, or supersede, this understanding.

III. Wage Schedules being paid as of August 9, 1934 will not be affected by the minimum wage provisions of any codes applicable to the Company's operations. No reduction in such wage schedules is contemplated.

IV. When it is necessary to reduce the working force, consideration shall be given to the following factors: Seniority—i.e., the length of employee's continuous service with the Company; Family Status—i.e., whether married or single, number of dependents, etc.; Ability—i.e., individual employee's skill and efficient service; Residence—i.e., whether or not employee lives in the community in which the plant is located. When the factors—Ability, Family Status, and Residence—have equal weight in the above consideration, Seniority shall govern.

Employees who are essential to the efficient operation of the plant, because of special training or ability, may be retained or rehired, regardless of the other factors involved. The above rules shall apply by departments in any given plant, but the Company may give consideration to these rules in other departments of the same or other plants. Any employee or his representative or representatives shall, upon request, be advised of the reason or reasons why he has been dismissed or laid off.

V. Whenever a reduction of force or a reduction in hours is necessary, the Company will give four days' notice of such reduction unless cancellation of orders, breakdown, accidents, or other emergencies make such notice impossible.

VI. When an employee is transferred to a lower rated job, he will receive the rate for the job to which he is assigned.

VII. When an employee is transferred to a higher rated job and qualifies therefor, he will receive the rate for the job to which he is assigned.

VIII. In the restoration of force, the same consideration mentioned in paragraph IV shall govern and if practicable, the employee shall be returned to his former position. Notice of a restoration of force shall be given by the Company as long in advance of such restoration as conditions will permit. If an employee is not available within forty-eight (48) hours after notice of such restoration of force is given, he shall forfeit his place in that particular restoration of force, but, if within a period of ten (10) days he so requests it, he shall be given the same consideration at the time of any such subsequent restoration of force. An employee shall not lose his seniority status because of a lay-off, but his continuous service record shall not be lengthened during the lay-off period. An employee previously laid off due to a reduction of force who was not restored to his former position when the force was restored, or his representative or representatives shall, upon request, be advised of the reason therefor.

IX. When a new job is created or a vacancy occurs, consideration shall first be given to the oldest employee in the point of service, and he shall be given a trial if in the opinion of the management he has sufficient ability to fill such new job or vacancy. The employee's failure satisfactorily to fill the new job or vacancy shall not penalize him with any loss of seniority. Any such employee or his representative or representatives shall, upon request, be advised of the reason or reasons why he was not chosen to fill the new job or vacancy.

X. When the requirements of the plant will permit, an employee shall, on his request and for reasonable cause, be granted leave of absence without pay for a limited time with the privilege of renewal. An employee absent on leave who, without the consent of the Company, engages in other employment or who fails to report to work on or before the expiration of his leave, will be considered as having quit without notice; if and when such an employee is rehired by the Company, he will have lost seniority rights acquired through previous employment.

No Discrimination

XI. There shall be no discrimination by foremen, superintendents, or any other person in the employ of the Company against any employee because of membership or non-membership in a labor organization or any other organization.

XII. The Company has the right to discharge or lay-off any employee for cause, but the employee or his representative or representatives shall, upon request, be advised of the reason or reasons for such discharge or lay-off.

XIII. Should an employee feel that he has been treated unjustly, he or his representative or representatives may present his grievance to

the proper representative of the Company, who will give it prompt and thorough consideration. He or they shall first take the matter up with his immediate superior. Failing satisfactory explanation or settlement, he or they may appeal in turn to the general foreman, department head, plant superintendent, and highest ranking local representative of the Company. All requests for hearings with such local representatives of the Company shall be granted within ten (10) days after the application therefor, such applications to be preferably in writing. All local plant conferences between an individual employee or his chosen representative or representatives and the local plant management, which must be held at the local plant during his or their regular working hours, shall be without loss of time to any such employees. Should the highest ranking local representative of the Company and the individual employee or his representative or representatives fail to agree, the matter may be submitted in writing to the President of the Company for his disposition after full consideration and such hearings, if any, as he may deem necessary or desirable. In the event that the employee or his representative or representatives are dissatisfied with the explanation or disposition of the matter made by the President of the Company, the matter shall, if agreed upon by both parties, be submitted to arbitration. In any event, any employee or his representative or representatives has the right, to the extent provided by law, to carry such matter to the National Labor Relations Board for its disposition; and nothing in this agreement shall be interpreted to detract from or add to such right of any employee or his representative or representatives.

XIV. This Agreement shall be in effect for a period of six months and thereafter, until modified, after at least fifteen (15) days' notice.

GE Resumes Unemployment Reserves Plan

GENERAL Electric Company's unemployment reserves plan, adopted in June, 1930, and operated under its emergency provisions since December, 1930, was returned to normal status on November 1st. During the four years almost $5,500,000 was collected from employees and the company, and over $3,700,000 disbursed for employee benefits, leaving some $1,800,000 in the treasury.

This plan operates on the basis of equal contributions from employees and the company; is administered by boards made up equally of employee and company representatives. Funds are held in separate account by trustees.

With return to normal operation the plan was slightly amended. As it now operates, an employee participates immediately upon being hired. Formerly he had to wait a year. Maximum benefit is $15 a week, for ten weeks, with provision for loans without security or interest up to $200, and relief grants of $100, in any year.

In normal operation the plan calls for payment of one per cent of actual earnings by each employee earning not less than 50 per cent of his average full-time rate, until he has made normal payments of 156 weeks.

During severe unemployment, emergency is declared and member payments cease. Collections of one or two per cent are then made from all employees receiving 50 per cent or more of full-time rate. Salaried employees earning $50 or more per week, although not normally eligible for membership in the plan, contribute during an emergency.

General Foods Adopts Annuity Plan

ANNOUNCED November 18, 1934, General Foods Corporation's cooperative annuity plan assures old-age retirement incomes for employees in 45 plants and 29 sales districts. Retirement ages are set at 65 for male, 60 for female employees. Contributions from employees are matched by the corporation.

The amount of income depends upon length of service and rate of earnings prior to retirement. An employee may expect to enjoy an income equivalent to 2 per cent of average earnings for every year of participation in the plan. Taking the typical case of an employee aged 35 today, he will receive 60 per cent of whatever his average monthly income may be during the next 30 years.

If participating workers leave the corporation, they may (1) have their contributions returned, or (2) leave them with the insurance company as a paid-up annuity. If they have participated for fifteen consecutive years, they can, by leaving their own deposits with the insurance company receive retirement income based on the corporation's contributions as well as their own.

Selected Reading on Job Insurance

HOW MUCH do you want to know about unemployment insurance? If you think you haven't time for more than a "quick shot," try "Twenty Questions on the Economic Security of the People." Send 25 cents to the General Board of the Y.M.C.A., 347 Madison Avenue, New York, and get a clear, comprehensive statement of the facts that will help you form your own conclusions.

For more extended study, there is a series of monographs on social insurance that you can get without charge from the Metropolitan Life Insurance Company, 1 Madison Ave., New York. Monograph One is "Unemployment Insurance"; Four, "Social Insurance Legislation"; Five, "The Administration of Unemployment Insurance"; Six, "The Limitations of Unemployment Insurance"; while several others give the details of British experience.

Keep in mind also that the National Industrial Conference Board, Inc., 247 Park Ave., New York, has a new book on unemployment insurance that will be off the press before the first of the year. It will probably cost 50 cents.

Other sources of information are National Association of Manufacturers, 11 W. 42d St., New York, with its "Unemployment Insurance Handbook" ($1); Industrial Relations Counselors, Inc., with a number of standard references in this field; the Industrial Relations Section, Princeton University, Princeton, N. J.; U. S. Department of Labor, Bureau of Labor Statistics, with Bulletin No. 544 (50 cents).

OPERATING SHORTS

Stevedoring Tractors

REGINALD TRAUTSCHOLD
Pompton Plains, N. J.

Speed and economy are essential when shifting and realigning heavy machinery in a busy factory. At the plant of the Cleveland Tractor Company, Cleveland, this class of work is customarily assigned to one of the crawler-type tractors manufactured at that establishment. No matter how heavy the duty, these machines work more rapidly and place machines more accurately than was previously possible.

Heavy machine tools, such as the 7,000-lb. multiple-drill press illustrated, are hauled or shoved to new locations, even from one building to another, while machines standing on legs are placed on skidplates and pulled into position.

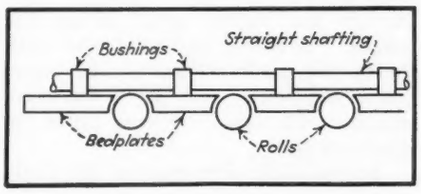
•

Checking Alignment of Bedplates

JOHN E. HYLER, *Peoria, Ill.*

Maintaining proper alignment of machine bedplates in series, with rolls between, is a complicated job unless means are available for making a quick check. In most cases the rolls are slightly higher than the bedplates, making it impracticable to use a straight-edge, although it can be used to advantage in aligning the rollers.

The tool shown is applicable to all cases and is especially helpful for crosswise aligning, checking of wear on individual plates, and so on.



It consists of a piece of perfectly straight shafting, with turned and bored bushings mounted on it with a snug, push fit. When using this tool it is laid in place as shown, and a thin piece of tissue paper put beneath each bushing. If any of the pieces of tissue are loose enough to slip out readily, the corresponding bedplate must be slightly raised. The plates are thus brought to the point where all the pieces of tissue are snugly held.

The diameters of the bushings may be varied in order to maintain any required relative setting of the plates. Thus, if the front infeed plate of a planer must be kept ¼ inch lower than the others the corresponding bushing will be ½ inch greater in diameter.

This tool will roll crosswise of the machine bed, making it convenient for crosswise checking at all points.

Mr. Hyler's contribution has been awarded the $10 payment offered by the editors for the best Maintenance Short submitted during the past month.

•

Thawing Frozen Water Pipes With Arc Welding Generator

S. C. OSBORNE, *Chief Engineer*
Wilson Welder & Metals Co., Inc.
North Bergen, N. J.

Thawing frozen water pipes is a troublesome job for which an arc welding generator is well suited. All that is necessary is to connect the terminals of the welding generator through suitable cables to opposite ends of the section of frozen pipe. The heat generated in the pipe by the current flowing through it is sufficient to melt the ice quite rapidly.

A number of precautions must be observed. It is essential that the current capacity of the machine never be exceeded for any extended period. If the pipe can be thawed in 1 hour the current can be brought up to the full 1-hour rating of the machine. If the pipe can be thawed in 15 minutes to one-half hour the generator may be used at full capacity provided it is allowed to cool for a time after one section has been thawed.

It is always advisable to take a long enough section of pipe so that the terminal voltage of the machine is approximately its rated value. That is, when using a 25-volt machine take a long enough section of pipe so that the voltmeter of the machine shows 25 volts, and so on. The object is merely to operate the machine at its maximum efficiency. In any event the machine should never be operated at more than rated terminal voltage.

It is difficult to specify the current value to be used for different sizes of pipe because joints, the presence or lack of insulation, and the location of the pipe (whether below ground, in a wall or concrete floor, or out in the open air) affect the heat loss from the outside of the pipe and therefore the amount of heat required to melt ice in it. The accompanying table may be used as a guide. It is based on the assumption that the pipe has been frozen

solid, that it is in free air, and that approximately half of the heat is lost from the outside of the pipe to the air. The pipe sizes given are for standard-weight iron pipe.

Current values given in the table should be sufficient to melt the ice completely in 1 hour. If the pipe is small, increasing the current will shorten the time. However, the current values used should never be greater than four times those given in the table because of the danger of damaging fittings and joints in the pipe.

If the pipe to be thawed is exposed to very low temperature, such as on the outside of a building, in frozen ground, or under freezing water, higher current values must be used. Hence, it can be seen that a great deal of "cutting and trying" is necessary in order to thaw frozen pipes satisfactorily under all conditions.

CURRENT REQUIRED TO MELT ICE IN PIPE IN 1 HOUR

Standard Weight, I.P.S., In.	Iron Pipe Amp.	Brass Pipe Amp.	Copper Pipe Amp.
½	30	45	80
¾	45	65	100
1	60	85	150
1¼	80	100	200
1½	125	150	300
2	170	200	350

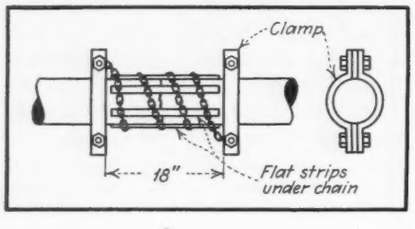
•

Emergency Repair of Large Shaft

H. E. ODENATH, *Chief Engineer Sears, Roebuck and Co., Philadelphia*

Breaking of a 3 13/16-inch shaft which was carrying a load of at least 150 hp. created a serious emergency. We knew it would take three or four days to secure a new piece of shaft of the proper length, with all the necessary keyways, shrinking of couplings, and so on, and this particular drive could not be spared. It was, therefore, imperative that we find some way to continue this drive in service.

To do this we cut a number of flat pieces of iron ¼ inch thick, ¾ inch wide and about 18 inches long, had the blacksmith make two clamps, as shown in the sketch, which were clamped securely to the shaft on each side of the break, and tied the flat pieces of iron over the broken joint with a piece of string. We then secured a heavy piece of chain, passed one of the bolts of each of the clamps through the end links and turned the shaft over until the chain came up snug. With this arrangement we kept the broken shaft functioning perfectly until the new one was secured.



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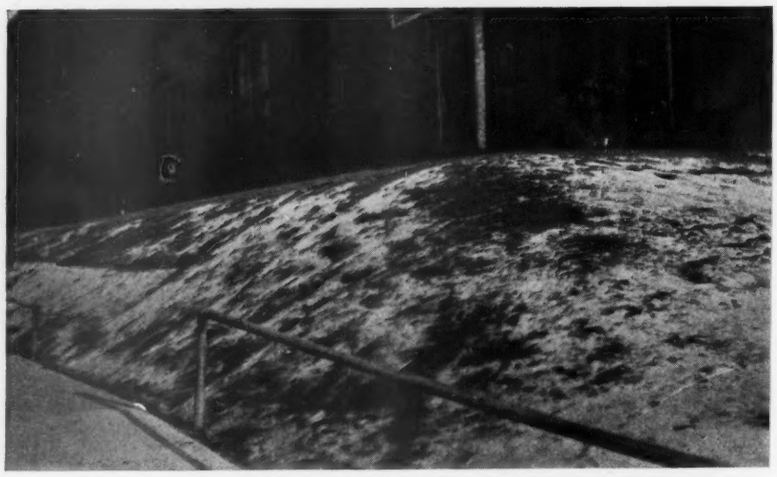


Sloping Lawn Easily Made

HARRY L. SPOONER, *Peoria, Ill.*

When winter comes, spring's not far behind, which means time to think about plant grounds.

If you have had poor luck seeding sloping land, try a method that worked like a charm at the L. R. Nelson Manufacturing Company, Peoria. After seeding, wet the ground thoroughly, then cover with cheesecloth tightly stretched and fastened down by 10-penny nails driven six inches apart along the edges. You will find that the cloth holds the earth effectively in place, stops washouts, acts as a moisture mulch. The grass grows right up through it.

You needn't even remove the cloth. Let it decay. For instance, if the lawn is made in the fall, the cloth acts as protection for tender young grass, will be practically decayed by spring.

•

Rotary Converter Serves as Double-Current Generator

J. L. YOUNG, *St. Marys, Ohio*

Recently the supply of 25-cycle current to a local plant was discontinued, which brought up the problem of obtaining direct current for the operation of a large yard crane, and 25-cycle alternating current for several intermediate-sized motors.

An apparent alternative was to prepare to use the 60-cycle current; but the cost of replacing all of the 25-cycle motors with the 60-cycle type was so great that this possibility was dismissed.

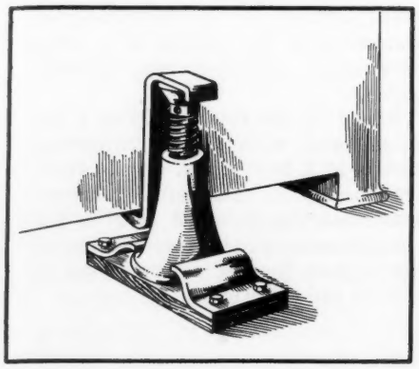
Thought was then given to the possibility of using a 60-cycle motor to drive a rotary converter, which had previously run on the 25-cycle and supplied direct current for a crane, so that both 25-cycle and direct current could be taken from the machine. Several test runs at various load points disclosed that such operation would be satisfactory, although some doubt had been expressed as to the results. It is a railway-type rotary converter of 400-kw. capacity, operating at terminal voltages of 650 volts d.c. and 400 volts a.c.

The only change involved in preparing the machine for its new service was the removal of the 25-cycle, direct-connected starting motor from the extension of the rotary armature shaft. This motor was replaced with a large pulley of the proper diameter ratio to that of the 60-cycle driving motor pulley so as to obtain the correct armature speed for the rotary. This was important in order to keep the frequency of the alternating current from the machine at the desired value of 25 cycles. No changes in the armature or in the internal electrical circuits were necessary.

The rotary has operated very satisfactorily since the change was made, requiring only the usual maintenance attention.

Adapting a High Jack for Low Openings

CHAS. H. WILLEY, *Penacook, N. H.*



Frequently it is necessary to shift machines on their foundations or lift other low, heavy objects under which it is not possible to place an ordinary jack. Under such conditions the forged step and base shown in the illustration are life-savers.

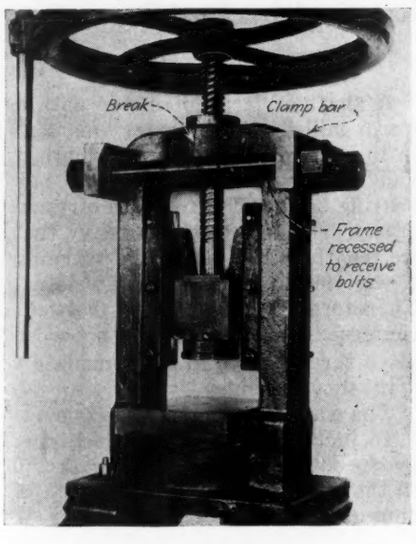
•

Broken Press Frame Repaired by Clamping

WILLIAM C. BETZ, *Equipment Engineer, The Fafnir Bearing Company, New Britain, Conn.*

When the frame of a 25-ton screw press broke across the screw hole hub, we found that to have the frame oxyacetylene-welded would cost approximately $80. A new frame would have cost nearly $200.

We could get no guarantee that the frame, if repaired by welding, would be any stronger than it was before the break; so we decided to repair it ourselves, which we did at a cost of approximately $40. The job was done as follows:



We made two bolts of 2-in. diameter machinery steel, threading both ends. Nuts were screwed on one end and the rods peened over to hold them in place. Two pieces of iron were planed to the shape shown in the illustration.

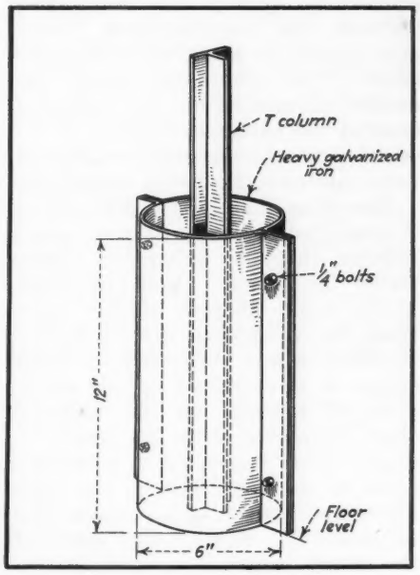
A recess was cut out on both sides of the frame to receive the bolt bodies. The bolts and the angle on the clamp bars hold the top of the frame so that it can not push up when pressure is applied to the screw. The nuts were tightened while the screws were hot.

This repair was made about four years ago and although the press has had very hard usage it is still in good condition.

•

Form for Reinforcing Steel Columns with Concrete

K. B. HUMPHREY
Waterloo, Wis.



Several small steel columns that support the perforated-metal growing floor in a malt house had rusted badly near the floor line, but were otherwise in good shape. There was a 4-foot space between the metal floor and the concrete subfloor, to permit circulation of air. Instead of replacing the columns a concrete base was poured around them.

To facilitate the work a two-piece, removable form was made of heavy galvanized iron. The two pieces of iron were bent around a piece of wood of the desired diameter and flanges formed, as shown. Two ½-inch bolts were used on each side to hold the form together. Although these forms were round, they could easily be made octagonal or square.

A form like this is much easier to handle and makes a better-looking job than wooden forms. Two bricks laid at each side of the form will keep it in position while the concrete is being poured. Greasing before pouring the concrete makes a smoother job and also facilitates easy removal.

•

Metal-Lined Bins for Packing Waste

SOURCE: *Norma-Hoffmann Bearing Corp., Stamford, Conn.*

To prevent newspapers and waste used in packing bearings for shipment from constituting a fire hazard, the bins in which they are stored have been lined with metal inside and out. The lid, counterbalanced to stay open for convenience, is hung with fusible links which will cause it to drop in case of fire, protecting or isolating the waste.

•

Keeping Constant Relation Between Variable Speeds

FRANCIS A. WESTBROOK
Center Conway, N. H.

A cement plant recently faced the problem of maintaining a constant relative speed between the slurry feeder for a rotary kiln and the kiln itself. It was worked out so successfully that the product is of much

more uniform quality. Automatic control was substituted for manual control and the results have been so good that other kilns in the plant are being modernized in the same way.

The problem involved synchronizing speeds where two machines operate at different speeds but the relation must be kept constant. With the old arrangement use was made of a slipring motor. Speed variation was not accurate because the load was not uniform. The feeder was driven by a 250-volt d.c. motor. Difficulty in maintaining the desired relative speed between the slurry feeder and the kiln was due to the fact that accurate control of the kiln speed was not always practicable with the slipring motor; consequently, when the controller of the slurry feeder motor was set for a certain speed the relative speeds were not always what was needed.

Furthermore, the manual control had the shortcomings of all manual operation in that it was subject to the skill and close attention of the operator. If, as sometimes happened, he did not make the proper adjustments, either too much slurry would be delivered to the kiln, impairing the quality of the output, or not enough would be delivered to it, which reduced the efficiency of production. Either of these conditions might, sometimes did, go on for an hour or two before being discovered.

The question of providing automatic electrical control of the motors was considered carefully, but it was found to be complicated, expensive, and not practicable under the conditions. It was shown, however, that a combination of mechanical and electrical control would be comparatively simple and inexpensive. It consists of a standard, variable-speed transmission with automatic electrical control and a differential control box. The arrangement is shown in the diagram.

SPECIAL NOTICE

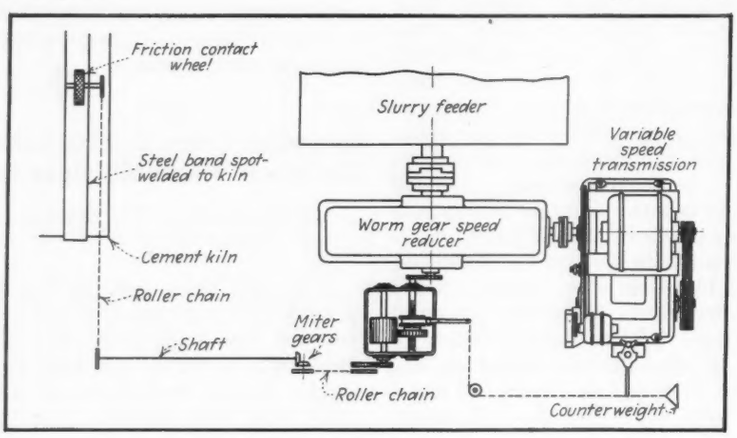
$10 will be paid for the best Operating Short submitted by the 20th of December. The Editors are the judges. Other Shorts accepted will be paid for at attractive space rates

A steel band ⅛ inch thick was spot welded to the kiln over its entire circumference. The speed of the kiln is communicated to a friction wheel made of a steel pulley approximately 12 inches in diameter, covered with brake lining, and held against the band by a heavy spring. A light roller chain transmits the rotation of the wheel to one of the shafts of the differential control box interposed between the variable-speed transmission and the machines to be regulated. The differential gives the needed movement to the extended lever of the automatic control on the variable-speed transmission which, in turn, controls the speed variations.

The other shaft of the differential is connected to the worm gear speed reducer through which the slurry feeder is driven. Both of these shafts must operate at the same speed, but in opposite directions, and if there is any difference in these speeds it is corrected by the movement of a collar on the threaded shaft connected with the speed reducer. This movement is communicated to the controller on the variable-speed transmission, which then automatically adjusts the speed of the slurry feeder.

The motor driving the feeder is mounted on top of the variable-speed transmission; the rotary kiln is driven independently. The threaded shaft of the differential is connected with the control lever on the electrical control of the variable-speed transmission by means of a small wire cable running over grooved pulleys.

Speed of the rotary kiln is ½ to 1 r.p.m. and with this arrangement speeds of 2 to 8 r.p.m. on the slurry feeder may be obtained. This speed range may be changed to 2 to 4 by changing one of the sprockets on the drive from the contact roller on the kiln to the differential.



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Correction

In the third paragraph of the article "Diesel Performance Meets Estimate," on page 519, November issue, it is stated: "A 31-day check of operating costs showed that during this period 8,360 kw.-hr. was produced with a total consumption of 898½ gallons of fuel oil, giving an average of 9.305 *gallons* per *kilowatt-hour.*"

The latter part of this statement is obviously in error and should have read: ". . . giving an average of 9.305 *kw.-hr.* per *gallon.*"

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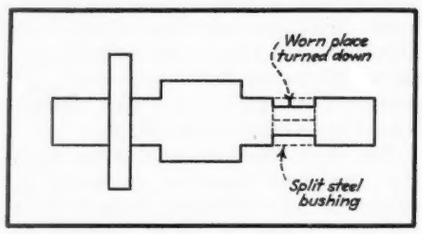


Worn Shaft Repaired by Bushing

HARRY SWANSON, *Minneapolis*

A shaft of large diameter with a worm milled in the center was sent in to have one end built up where it had been worn away when the ball bearing became clogged with dirt and froze. This shaft was so heavy that we felt there was danger of warping if we tried to build it up by welding. Therefore, it was put between centers in a lathe and the worn place turned down to accommodate a split steel bushing.

The wall of this bushing was made 3/16 inch thick. Careful machining produced a good fit on the shaft and in the ball bearing, at a minimum of time and expense.

Phototube Pump Control

Kept the desired water level in a standpipe when the watchman couldn't

H. H. ILER
Chief Engineer, Union Bleachery
Greenville, S. C.

RESERVE water supply for our plant is stored in a steel standpipe 100 feet high, having a capacity of 100,000 gallons. One-tenth of this capacity, 10,000 gallons, is allotted as a reserve supply for certain dwellings and the plant plumbing systems; the remainder is reserved for the automatic sprinklers and fire hydrants.

To effect this dual-storage feature, the 3-in. riser from the pump line was carried up to a point 10 feet below the overflow outlet. Fill pumping is done with the same pumps that supply the home and plant systems. If the pumps have to be stopped for any reason, 10,000 gallons of water is still available for home and plant use. Should this amount be entirely drawn out, there is a reserve of 90,000 gallons below the riser, for fire protection.

Since failure of water supply to the homes assures steps to restore the service as quickly as possible, the likelihood of having at any time an inadequate reserve for fire protection is minimized, because the 90,000-gal. supply below the riser must be restored when pumping is resumed.

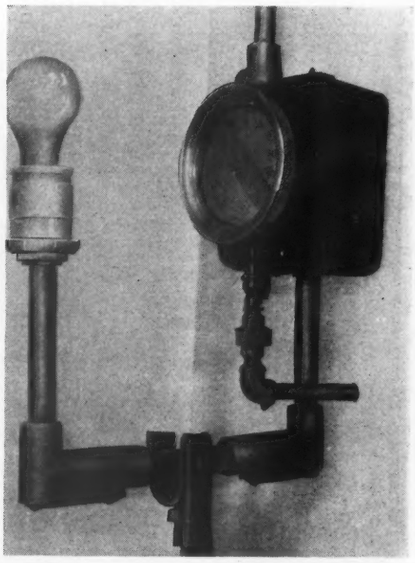
Formerly the watchmen were relied upon to start the pumps when the altitude gage showed insufficient reserve, and to stop them when the tank was almost full. As a result there were frequent shortages of water for homes and plant, and frequent overflows of the standpipe. These occurrences were not only annoying, but constituted a waste of power and water. Therefore, it was decided to make operation of the pumps automatic.

After investigation of different methods, none of which seemed suitable for our conditions, the phototube control system shown in the illustrations was worked out and applied. The cost was nominal; the system has been found to be effective and dependable.

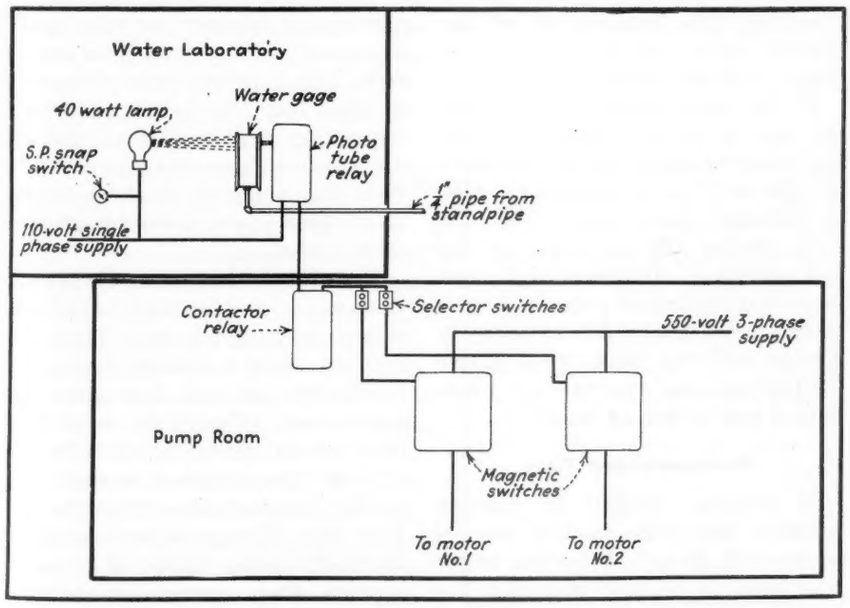
It will be seen that the conventional hand was removed from the altitude gage and a rectangular metal strip substituted as a light-beam interceptor. It is self-balancing in all positions; hence it does not affect the accuracy of the indication at any level. A hole was drilled through the dial and back of the gage to permit the light beam from a 40-watt lamp to pass through it and strike the light-sensitive cell inside the relay case behind the gage.

The position of this hole was located by calibrating the gage to 100 feet of water in the standpipe, as maximum, and to 90 feet as minimum. Then the indicating strip was set to intercept the light beam just ahead of the "full standpipe" position, and thus stop the pumps. When the level falls about 2 feet in the standpipe, the strip uncovers the hole enough to permit the light beam to affect the phototube and start the pumps.

A snap switch was provided to cut off the light when automatic operation is not wanted.



When the water level drops the hole in the gage is uncovered, allowing a light beam to pass through and fall on the phototube in the housing behind the gage

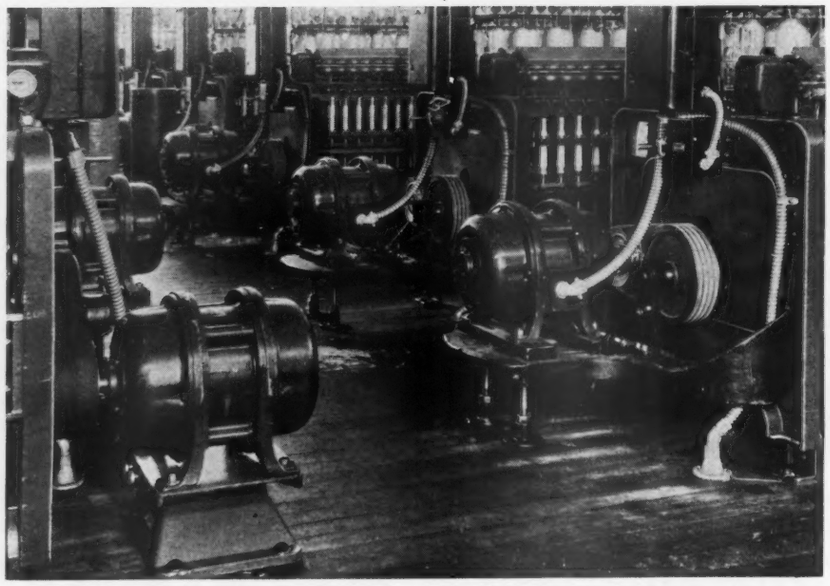


Schematic arrangement of phototube control for water pumps

Laying Out Individual Drives

What type and size of motor, what type and rating of mechanical power transmission equipment, for that new job?

ROBERT W. DRAKE
Mechanical and Electrical Engineer
Indianapolis



These 10-hp., 1,750-r.p.m. motors drive spinning frames. Motor pulleys are 8½ inches, and driven pulleys 12⅞ inches, in diameter, spaced on 11¼-in. centers. Light double belts, 4 inches wide, are used on the left-hand row of machines, V-belts on those at the right

APPLICATION of motors to individual machines brings out three problems—determination of the proper size of motor, selection of the best type of drive for the application, determination of the proper size of drive. Of these three problems the first is, in general, the most difficult, the second relatively easy, and the last intermediate in difficulty.

If one is installing a new machine and another identical or similar individually driven machine is in service, it is a comparatively easy matter to run a simple test to determine the average load, load peaks during operation, and duration of the peaks. It is then possible to make an intelligent choice of motor size to suit the load conditions of the new machine.

When the capacity of the motor on the machine in service is reasonably suitable, as good or better choice of motor capacity for the new machine may frequently be made by observing the temperature of the driving motor after five to eight hours of steady operation.

If the temperature measured on the back of the laminations exceeds the room temperature by less than 55 degrees F. or 30 degrees C., it is, in ordinary cases, safe to use the next smaller size of motor on the new machine. Temperature is best measured by pressing the bulb of a thermometer into a dab of putty in contact with the back of the stator laminations and covering the whole with a pad of felt or waste.

Temperature Test

A rougher method of judging whether the next smaller size of motor will do is: After the motor has been in normal operation for some hours on a hot summer day, if the hand can be borne on the back of the laminations continuously, even with severe discomfort, the next smaller size of motor will serve.

There are, however, exceptions to the application of motors on a temperature basis alone. In some instances the smallest size of motor that will be satisfactory is determined by the stalling load. Such applications are in the minority, although not uncommon.

With Heavy Flywheels

Punchpresses, shears, gang presses, and such machines fitted with heavy flywheels to assist in carrying the extreme peak loads are a case in point. The hardest work that the motor ever has to do is to overcome static friction and bring the flywheel to speed on some cold Monday morning when the oil has been squeezed out of the bearings over the week-end. Any motor capable of doing this will run cool when the press is under normal operating load.

Special motors are built that are particularly adapted for such applications, since they develop an abnormally high starting jerk. When up to speed they "lie down" under any momentary high-peak load and let the flywheel bear the brunt of it. Then they bring the flywheel quickly up to speed again, ready for another press operation.

Use of such motors is always advisable for driving individual machines with flywheels. They are cheaper, since a smaller motor will handle the job, and they cause less power loss, although at rated load these special motors are a trifle less efficient than standard motors. The saving in power comes from the fact that since the special motors are of decidedly lower rating, if correctly applied, they operate at a much higher percentage of rated full load.

For the same reason they give a higher average power factor.

Most conveyors, bucket elevators, and such loads are hard to start. It is not safe to apply motors to these loads solely on the basis of heating. Special motors are made for such applications. They have the same starting jerk as the motors designed for flywheel applications, but are not designed to slow down on peak loads, since there is no flywheel to carry through on the peaks.

Safe

Unfortunately, it is not usual to have a duplicate machine available for test. Then several alternatives are available, none of them very satisfactory.

For example, the driven machine may be motored according to the recommendations of the manufacturer. This procedure is almost invariably "safe." The manufacturer bases his recommendations upon the heaviest job the machine is capable of doing, with a safe, sometimes very large, margin. Obviously, his

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Mechanical power transmission is a field for power loss reduction in which plant men may make real savings in 1935

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recommendations must be based on the heaviest job, since if they are too "safe" nothing much worse than half-hearted complaints are heard, whereas if he recommends too small a motor he will have furious customers buzzing like hornets about his ears.

For such operations as shearing, punching, milling, drilling, cotton-spinning, and steel rolling, considerable research on power requirements has been carried out and the results have been published.

One who knows where to find that information can make a close estimate of the power required from consideration of the job to be done and the estimated production per hour. This is by far the best way to estimate power requirements of the few kinds of jobs to which it is applicable. Most plant engineers lack the necessary data and experience in their application except for a few types of machines.

In most cases the only practical method of fitting a motor to the job is to select it by guess or from the machine manufacturer's recommendation, much the same thing. When the installation is in service, test the motor with the machine running at full load, make any necessary allowances for the effect of oversize stock, abnormally tough or wet stock, or dull tools, and change to the correct size of motor.

Trial and Error

This sounds like a rather troublesome procedure, and so it is, but frequently there is no alternative except to operate a misfit motor and accept the increased investment, increased power loss through decreased motor efficiency, and the increased power costs and distribution

(Continued on advertising page 42)

Maintenance Ticklers

RICHARD DILWORTH
Plant Engineer, Lorraine Manufacturing Company, Pawtucket, R. I.

STICKLERS for good maintenance practice will find the maintenance ticklers we use in our plant a big help. Briefly, as head of a large maintenance force, my memory is severely taxed and would surely fail me if I did not resort to some mechanical means of backing it up.

Four or five years ago, therefore, I figured out a tickler system which has been in effect ever since.

For every maintenance job that must be done periodically, a form like the sample shown is made out. For permanency's sake we use an impregnated linen form that will stand more abuse than a card.

For instance, the sample instructs one H. C. Paul to take certain meter readings on certain dates. My clerk sees that the tickler goes to Paul, and when the readings have been taken and noted on the back, the tickler comes back to me duly signed. I sign my name over Paul's to signify that the matter has been properly brought to my attention.

Between myself and my department heads we have something like a hundred of these ticklers in service. They have done wonders. We are all tickled to death with the results we've been getting.

Tickler #4 Mr. *H.C. Paul*	Date	Sign Here	Date	Sign Here
Do following work upon dates given in margin to right	7-11-34		11-21-34	
Have readings of water meters taken and	7-18-34		11-28-34	
record made on back of this notice. Readings	7-25-34		12-5-34	
to be taken on Friday at 5 PM. State amount	8-1-34		12-12-34	
used in gallons	8-8-34		12-19-34	
3" meter - Cotton Dye House	8-15-34		12-26-34	
6" " - Mineral Spring Avenue	8-22-34			
8" " - " " "	8-29-34			
8" " - Grotto Avenue	9-5-34			
2" " - Tunnel	9-12-34			
	9-19-34			
	9-26-34			
	10-3-34			
	10-10-34			
	10-17-34			
	10-24-34			
	10-31-34			
	11-7-34			
	11-14-34			
Report to Mr. *D ilworth* when this has been attended to				

Reclaimed lumber costs Westinghouse $22 a thousand as against $36 for new crating material. Saving, under normal conditions, $1,200 a month

New Boxes for Old

Lumber salvage is one more attack on waste that many companies can profitably launch

H. A. HILLMAN
Cost Supervisor, Westinghouse Electric & Manufacturing Company East Pittsburgh

LUMBER salvaging operations in our East Pittsburgh plant save the company $1,200 a month. Usable lumber is available from crates from incoming material, blocking and piling from cars received, dismantling of buildings, and the salvaging of bins and other wooden equipment.

Reclaimed lumber is used to make crates for the shipment of completed apparatus, to repair wood reels and manufacture new reels; it is also sold for cash to employees. Boxes are saved for use in the factory and shipping department, and for maintenance work.

Graded on Receipt

Miscellaneous scrap lumber is received in the lumber salvaging department via railway cars, industrial trucks, or hand trucks from all parts of the factory. It is graded at the time of receipt as to suitability for use as boxing lumber and light scrap, blocking and heavy lumber, usable boxes either for use in the factory or for return to supplying works, and worthless scrap. Considerable importance is attached to this grading; it is easy to lose all possible profits by reclaiming lumber which costs more after expending the labor than its value.

Lumber that is too small, split, full of nails, or otherwise unsuited for reclaiming is immediately consigned to the boilers located adjacent to and in the same building with the lumber salvage department; these boilers generate high-pressure steam.

Large crates are knocked apart, nails pulled from the center of boards. Boards are passed to the circular saws to have a few inches cut from the ends, after which they are cut to lengths suitable for making standard crates. Open orders are furnished the lumber salvage department by the shipping department for lengths that can be used in large quantities. This makes economical cutting possible with minimum waste. It also eliminates the cost and waste of cutting in the box shop. Note that nails are removed by cutting a few inches from the ends of the boards. It takes less labor and eliminates split ends.

Figure It Out

Under normal operating conditions, six men are engaged in lumber salvage. The group is composed of one supervisor, two sawyers, one reel repairman, one drum cleaner, and one laborer. Cleaning oil and varnish drums by steaming and in a rotating drum cleaner is combined with lumber salvage because drum cleaning is a part-time job.

Lumber salvage under normal activity in the factory—which is about 80 per cent of capacity—amounts to 35,000 board feet a month. The standard or budgeted cost for reclaiming this lumber is $22 per 1,000 board feet. This replaces an equivalent amount of new boxing lumber after it is cut to length, ready to be made into boxes. The average cost of new boxing lumber is about $30 per thousand. Making an allowance for short ends and the expense of cutting, the reclaimed lumber replaces a like amount of new lumber at about $36 per thousand. There is a net gain of $14 per thousand or $490 per month.

Old Crates Repaired

In addition to the lumber salvaged, approximately 1,000 crates per month are returned for use at a saving of about $.30 per crate after making allowance for handling and freight charges, a total of about $300 per month. About 250 broken wood reels are repaired and 200 drums cleaned per month. A considerable quantity of sawdust is delivered to the shipping department for packing, and sales of reclaimed lumber to employees amount to several hundred dollars per month. While it is difficult to measure the exact savings realized, an estimate of $1,200 per month is probably conservative under normal operating conditions.

Extra Eyes for Executives

If you can't be in two places at once, let a central supervisory system tell you what's going on

H. R. KIRKLAND
President, H. R. Kirkland Company
New York

OPERATING executives and supervisors can be in only one place at a time, and hence can hardly be expected to check personally all of the conditions that may need watching. Where the indication or control required does not justify the use of expensive instruments, or they are not applicable, a so-called centralized supervisory system will save much time and effort.

The heart of such a system is a central annunciator, which should be placed where it will most readily receive attention, or be within the vision of those who supervise the activity in question. Annunciators can be built in numerous ways, but the lamp type is the simplest. It can be used for supervision of all devices where a permanent electric contact indicates an abnormal condition. No relays or other mechanisms are used; therefore this type of annunciator is practically foolproof and troubleproof, seldom requiring attention.

Easily Installed

A lamp annunciator usually consists of a group of bullseyes banked as required, each having a small, pilot-type lamp behind it that, when lighted, illuminates the lens in the bullseye. The lens should be convex type with a ground flat back, giving a frosted effect which prevents distortion of numbers or letters placed behind the lens. With such a type of bullseye, color inserts can be used behind the lens. Diameter of the lens to be used depends upon the visibility required. The usual commercial types come in sizes from $\frac{5}{8}$ to 1 inch in diameter. Most people can read $\frac{5}{8}$- to $\frac{3}{4}$-in. numbers on a 1-in. lens at a distance of 30 feet.

Central supervisory systems are simple and inexpensive to install, but certain standards must be maintained. Since they operate on low voltage, conduit is not required, except where desirable as a protection for the wire. Standard rubber-covered copper wire should be used; unless the runs are unusually long, No. 19 wire will suffice. The type of wire usually used for telephone installations is satisfactory.

Current Required

Twenty-four volts is probably the best operating voltage. Where alternating current is available, a transformer can be used; it should be of sufficient capacity to light all of the lamps at one time, although such a condition would hardly ever exist. For d.c. operation it is desirable to use a small motor-generator set. Battery operation is not recommended unless duplicate sets are available with suitable charging apparatus.

Lamps of the G6 or T3 type are preferable. Current consumption of these lamps is approximately 0.17 amperes. In order to insure long lamp life and dependable service, it is advisable to operate signal lamps considerably under their rated voltage. They will produce satisfactory illumination when operating 25 per cent below rating. Lamps of 25 per cent higher voltage rating than the service can be obtained (for example, a 32-volt lamp for 24-volt service), or small resistors can be placed at or near each lamp to reduce the voltage. These methods are superior to having the transformer or generator produce a lower voltage at the source, since line losses are controlled better.

For many reasons, it is necessary to keep the temperature of certain rooms, ovens, tanks, and so on,

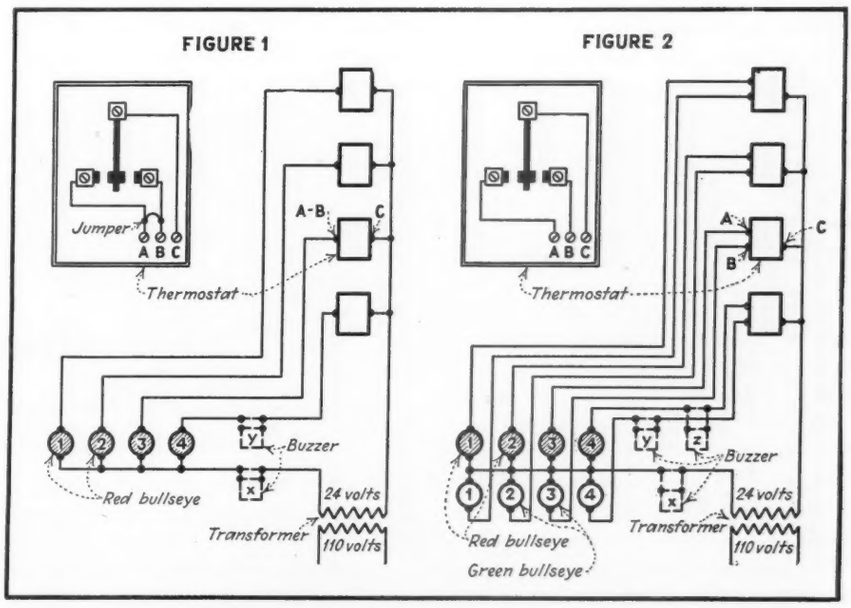


Figure 1. With this scheme of connections the thermostat or other contact-making device indicates when either the high or low limit has been exceeded, but does not distinguish between them. A buzzer in the common return, as at *X*, will sound as long as any lamp is lighted. Buzzers in each lamp circuit, as at *Y*, give individual signals

Figure 2. This connection scheme tells whether the high or the low limit has been exceeded. Buzzers connect as shown, work as in Figure 1

within a prescribed range. It is frequently desirable, always easy, to supervise temperature from a central point, thereby eliminating the need for constant reading of devices located at various points in the plant.

Control by Temperature

In such installations, some form of thermostat actuates the signal. These devices vary in construction and principle of operation. The bimetallic type, which embodies a curved strip of two dissimilar metals welded together, is popular and simple. One of the metals expands and contracts faster than the other; hence a rise in temperature causes the strip to straighten and touch a contact, establishing an electrical circuit indicative of a temperature exceeding the predetermined value. Decreasing temperature causes the strip to curve until, at the lower range limit, a contact is again established.

As many thermostats or contact-making temperature regulators as desired can be supervised on the same system. A simple, common-return wiring circuit, as shown in the illustration, is employed.

This general service can be arranged to indicate: (1) That a certain temperature device has recorded an abnormal condition, either high or low; with this service, only one bullseye (wiring system No. 1) is used for each thermostat; (2) that a certain temperature device has been actuated, and to indicate whether the temperature has gone too high or too low; two bullseyes (wiring system No. 2) are used for each thermostat, one to show red, the other green; (3) with either system a buzzer can be installed at the annunciator to give an audible alarm when an abnormal condition exists, or installed at each thermostat to sound a local alarm, in addition to the central indication.

Pressure controllers find varied and wide application in the industrial field, and are admirably adapted to central supervision. Devices are available for indicating or controlling the pressure of air, steam, gas, oil, and other liquids, for use with pumps to maintain pressure or liquid levels, and so on. In many cases these devices make contact through a mercury tube; hence, in so far as the circuit is concerned, they operate in exactly the same manner as thermostats.

With certain applications it will be desirable to prevent false signals caused by momentary fluctuations rather than by actually abnormal conditions. For this purpose small thermal timing units can be employed. Wiring system No. 1 will require one thermal device, and system No. 2, two devices, for each pressure controller.

These thermal units can be timed so that they will delay the contact made by the pressure device for a specified number of seconds; after this period is over, if the contact is still "made," a signal will be received at the central annunciator, indicating a truly abnormal condition.

Humidity controls are likewise available and can easily be arranged for central supervision. They can be furnished with the same single-pole, double-throw type of contacting device and be incorporated into a system in the same manner as the temperature- and pressure-indicating devices.

There is a tendency today to extend central supervision of factors or operations directly concerned with production. One of the most interesting applications of this kind is associated with devices known as predetermined counters. Such counters are similar in appearance and design to the usual industrial-type counter, but they have in addition a means of making an electric contact at a predetermined number.

The counter can be set to any desired number within its capacity, and when that number has been reached a contact will be made, lighting the bullseye in a central annunciator and indicating the fulfillment of the predetermined requirements for a certain operation.

For example, a predetermined counter attached to a machine may be set to indicate when 931 pieces have been produced. When that figure is reached the bullseye is lighted. It is a simple matter to arrange to have a bell rung at the location of the machine, thus affording a local alarm as well as central indication.

Provision is made for continuous illumination of the bullseye and ringing of the bell until the machine has received attention, thus insuring the necessary attention and preventing the next cycle of operation without resetting the device.

These counters can, of course, be connected through gearing or otherwise to the production machine, and are available for practically any desired applications.

In a succeeding article to appear in an early issue other applications of centralized supervision will be discussed.

Plant operating men shouldn't have to worry about things that go according to plan, but must know at once when something doesn't. Supervisory systems tell tales when troubles come

Fluosilicate Won't

H. D. FISHER
Plant Engineer, New Haven Pulp & Board Company
New Haven, Conn.

IN THE October issue you gave a pretty unconditional endorsement to the fluosilicate hardeners for concrete floors. We have used these several times and I cannot agree with the article on page 469, for while the treatment produces some improvement it is not enough to change substantially the character of the floor, and I feel that the statements the author makes are rather misleading. A soft, poorly finished floor is still a poor floor after using fluosilicate, and we have not been able to notice a substantial decrease in the amount of dusting after treatment.

Our experience has been that the integral metallic hardeners greatly increase the resistance of concrete floors to wear and that painting is the best way to reduce dusting.

As Production Goes

So go maintenance costs—when department budgets are tied up with foremen's pay envelopes

NORRIS W. BIGGS
Production Foreman, B. F. Goodrich Company, Akron

THERE has been raised in *Factory Management and Maintenance* a question regarding ways of making budgets for maintenance work flexible enough to follow variations in the rate of production. I believe that this objective can be achieved better by the use of an incentive plan for maintenance work than by budget adjustments. The reductions will follow progressively each month, and percentage relations to production will adjust themselves automatically.

I suggest these steps in putting such a plan into operation:

1. Make "Lost Time Due to Mechanical or Electrical Delay" a chargeable item in departmental production budget schedules. Provide an allowance in the budget. If a production foreman is allowed to shift personal responsibility for a stoppage by notifying the maintenance department, this item can be reduced more readily than appears possible. In one instance our reduction was approximately 70 per cent.

2. Require a daily report on "Repairs and Stoppage of Machines" by production foremen, giving the following information: (*a*) Time machine stopped; (*b*) time repair work started; (*c*) time repairs completed.

Weeds Out Bad Practices

Upon completion require maintenance mechanics or electricians to turn in card or order slip to maintenance foreman with production foreman's signature authorizing charge of time to his department. This arrangement insures speed, cooperation, and efficient planning in emergencies. It is possible under this plan for production foremen to refuse to sign the card. Such action weeds out inefficient practices and men who otherwise would be regarded as necessary.

3. Make increases in relative maintenance cost an item chargeable to supervision in both maintenance and production departments. Make decreases a credit item. Agree upon a unit of measure of what is termed "plant activity"; it may be units produced, direct labor hours, or direct labor payroll. With this unit established, determine from the records the percentage ratios of three or more periods.

Budgets and Ratios

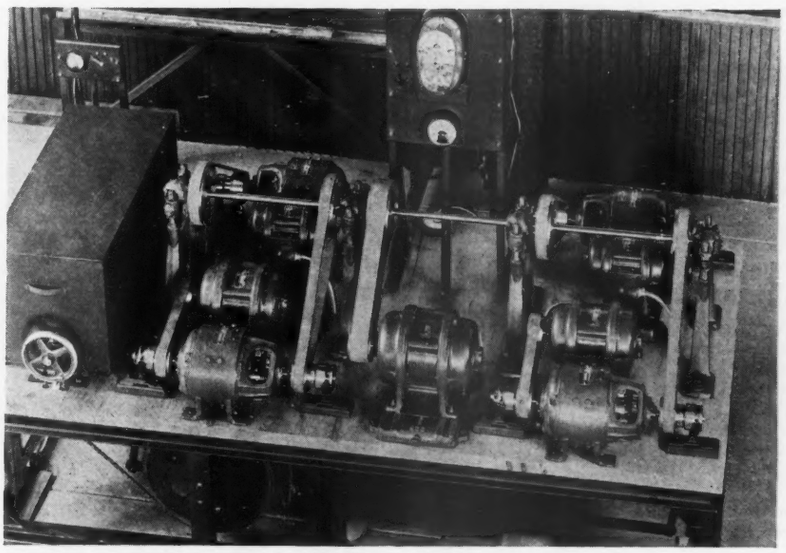
Agree on an objective—for example, a given percentage of reduction in average ratio. I suggest that the maintenance foreman and production foreman of the department for which the budget is being set be included in the conference. Sometimes they will set a budget smaller than the management expects. It is the logical way to sell the idea. When the ratio has been established, the budget need not be predetermined. It can be computed at the conclusion of the period, and the credits and debits entered.

4. Make production foremen cost-conscious by requiring their signatures on itemized maintenance cost sheets each month. Make the term "preventive maintenance" mean something. For example, an electrician who was experienced in motor winding and panel installation was able, by spending one hour a day on a tour of inspection, to prevent stoppages and burnouts that would have cost thousands of dollars, as shown by maintenance costs before the plan was started.

From Drivers, Leaders

5. Tie up budgets with the pay envelopes of the foremen and inspectors in charge. Give them an incentive to exercise sound judgment in industrial management. This scheme is most effective. It converts a driver into a leader; makes the "hot spot" on the office carpet practically a normal relationship.

This method of handling maintenance costs has two important advantages: (1) The budget fluctuates directly with the volume of production; (2) a keen interest is maintained because the objective is never stable. Carrying out the plan develops business foresight in the men who have the most direct opportunity to use it.



AN EXAMPLE OF INDUSTRY MERCHANDISING. To demonstrate group and individual drives The Power Transmission Council is exhibiting this model. It comprises four d.c. generators driven in a group by one motor or individually by separate motors. Four banks of lamps load the generators, a sign flasher serving to vary the cycle. Meters show power factor and power consumption under different operating conditions

What Price Correction?

Low power factor is too expensive a luxury for any plant; so are some methods of correcting it. Use meters to check the cost

J. E. McILVENNY
Electrical Superintendent, The Bessemer Limestone and Cement Company
Youngstown

SAVINGS possible by maintaining high power factor are easily computed when users of power purchase it under a contract by which they are penalized for poor power factor.

If the power factor problem is to be solved successfully the figures used should be obtained by metering.

In the case under discussion power is purchased under a contract by which the buyer is penalized for power factor below 75 per cent lagging and given a discount for power factor higher than 85 per cent lagging.

The plant has a total connected load of 11,907 hp., of which 5,628 hp. is in induction motors and 6,279 hp. is in synchronous motors. The synchronous motors vary in size from 25 to 900 hp. There is 3,800 hp. in synchronous motors connected to their loads by means of magnetic clutches, thus making them available for operation as synchronous condensers when the loads are off. The highest measured 15-minute demand during the past four years was 5,871 kw., with a monthly energy consumption of 3,517,408 kw.-hr. The lowest measured 15-minute demand was 197 kw., with an energy consumption of 60,908 kilowatt-hours.

As one means of reducing cost in the realm of power—correct power factor

By running these synchronous motors without loads whenever possible the over-all plant power factor was improved, an average of 95 per cent lagging being obtained during operating months. This practice was generally accepted as economical since by keeping the power factor up power bills were lessened, but the motor losses were not properly calculated.

The problem was first approached in the following manner: In January and February of 1933 the synchronous motors with magnetic clutches were operated with maximum excitation and no load, with a resulting power factor of 83 per cent lagging in January and 73 per cent in February. Energy and demand in kilowatts taken by these motors were noted. In March and April the motors were not operated, with resulting power factors of 54 and 52 per cent, respectively.

It was noted that the unit cost for energy was lower in January and February than in the next two months, but a portion of the lower-cost energy of January and February had been used for corrective purposes, whereas all the energy for March and April had been used for production. When the cost of corrective energy and demand was taken into account it was found that the cost of productive energy was actually higher in January and February than in March and April. However,

(*Continued on advertising page 58*)

Savings Resulting from Power Factor Correction

1933 Month	Kilowatt-Hours	Reactive Kva.	Power Factor	Load Factor	Measured Demand, Kilowatts	Actual Bill	Corrected Bill*	Energy Cost per Kw.-Hr.	Saving
January	102,286	108,000	83	51	266	$1,348.62	$1,048.62	$0.013184	$300.00
February	72,498	114,000	73	34	273	1,181.24	1,083.70	0.016251	97.54
March	63,906	180,000	54	37.6	228	1,183.02	966.74	0.01815	216.68
April	71,813	186,000	52	29.4	328	1,512.82	1,113.28	0.021066	399.54
May	1,978.304	672,000	95	70	3,784	17,739.18	17,510.24	0.0089	228.94
June	1,412,109	720,000	90	83	2,360	12,388.75	12,083.12	0.008773	305.63
July	1,389,890	702,000	90	82.6	2,260	12,072.01	11,827.02	0.008685	244.99
August	1,424,294	624,000	92	84.8	2,256	12,135.04	11,901.59	0.008520	232.75
September	1,391,857	564,000	93	80.8	2,224	12,063.69	11,716.68	0.008667	347.01
October	140,219	144,000	80	49	407	1,844.34	1,756.30	0.013153	88.04
November	698,043	150,000	98	74	1,313	6,414.20	6,644.43	0.009188	230.23
December	115,840	30,000	99	30	516	1,704.55	2,159.92	0.014714	455.37
1934									
January	63,960	18,000	99	43.4	197.9	959.90	1,345.35	0.015007	385.45
February	60,872	30,000	97	44.3	204.5	939.23	1,221.39	0.015429	282.16
March	74,612	36,000	96	37.8	265	1,064.65	1,524.93	0.014135	460.28

*For January to September, 1933, inclusive, these figures show what the bills would have been if power factor had been corrected. Savings for these months are likewise estimates. Figures for November to April, inclusive, show what the bills would have been if power factor were *not* corrected. Savings given for these months are actual reductions.

To Keep Fire Extinguishers from Freezing

UNLESS extreme vigilance is exercised the best fire fighting equipment may be temporarily disabled by frost. Automatic sprinkler systems, hydrants, and all appliances using water for fire extinguishment require special care and attention in winter. The following precautions should be taken, inspections being thorough, with nothing taken for granted:

Sprinkler Equipment

Be sure that man in charge is fully posted as to the purpose of every valve and pipe. It is also essential that the night watchman understand the operation of all valves and the importance of giving proper and prompt alarm.

Buildings

See that all portions of buildings are properly heated at all times to prevent freezing in any of the sprinkler pipes, particular attention being given to exposed places such as hallways, entries, stair towers, elevator shafts, show windows, shipping rooms, attics, roof monitors and skylights, and spaces between ground and first floor and under sidewalks.

To be safe from freezing a temperature of at least 40 degrees F. should be maintained.

Tanks and Fittings

Examine tanks and all pipes, fittings and valves, whether for steam heating, general water service, or fire protection. See that none is frozen or has been frozen, and that all are in operative condition; where there is any possibility of freezing, provide the necessary protection.

Besides seeing that tank heaters are in proper order it is important to make certain that they are of adequate capacity. Heaters and circulating pipes should be cleaned of any rust or sediment.

Tanks should be cleaned and tank supports properly painted.

Examine carefully and provide suitable boxing around any pipe lines which may be in exposed locations (either between ground and first floor, between buildings, or near windows, etc.). Make frequent tests during the winter in order to make sure the piping is free from frost.

Open joints or gaps in the boxing are a prolific source of trouble. It is essential that all such defects be discovered and remedied forthwith. Joist channels and tank platforms are places of special danger in this respect.

Dry Valves

See that sprinkler dry valves are in working order, not leaking, and that alarm connections and gong are in operative condition. Should a valve trip and, without giving an alarm, admit water into the pipes where it may remain undiscovered, freezing is liable to occur with disastrous results.

Make sure that piping in dry systems is thoroughly drained and that the system holds air pressure well. All pipes should drain back to the dry valve. In cases where this is impossible, drip valves should be installed at low points and carefully watched during cold weather. Drip valve outlets should be plugged as a safeguard against leaking or tampering.

Dry-pipe valve closets should be properly constructed and permanently heated, preferably by steam, electric heater, or gas heater with flame properly protected. Lanterns and oil stoves, if used in emergency, should receive constant, careful supervision; the hazard of heaters of this character is intensified if the closet is not provided with a fire-resistive lining.

Supply Valves

See that all supply valves are open, and try water outlets to ascertain if all pipes are free and ready for service.

Fire Department Connections

See that fire department connections drain properly and that caps are in place and well lubricated.

Extra Sprinklers

Have on hand, for emergency use, a supply of extra sprinklers; also (to facilitate repairs) extra fittings and plugs, together with a special sprinkler wrench.

General

When it becomes necessary to close a sprinkler valve during working hours, a competent man should be stationed at the valve, so that water can be turned on immediately in case a fire occurs.

In case of extensive changes in branch piping, have the sprinkler pipe plugged where disconnected. The pipe should not be unplugged until the branch piping is entirely re-arranged and the workmen are ready to make the final connection. By following this procedure, instead of having the water shut off at the post indicator valve while the work is going on, normal water pressures can be maintained on all but the disconnected sections of a system.

When changes or repairs are made in the system the inspection department having jurisdiction should be notified before water is shut off, and care should be taken to see that the least possible portion of the equipment is out of commission at one time. The city fire department should be informed whenever a system is out of commission.

Note. The wise property owner will avail himself, not merely during periods of emergency but at all times, of the advice and cooperation of the inspection department with a view to the maintenance of his equipment at the highest degree of efficiency.

Fire Pumps

Ascertain by tests that pumps are in condition for immediate service. Every pump should be started at least once a week, and water discharged through relief valve or other outlet.

In the case of steam pumps, see that steam connections and traps are in perfect order. Ample steam should be maintained at all times.

In the case of electric pumps all wiring and connections should be thoroughly examined and tested.

Give special attention to the heating of pump rooms. The temperature in these rooms must not be allowed to fall to a point at which there will be danger of freezing.

Examine the ends of suction pipes to see that leaves or other refuse matter have not clogged holes in strainers. The capacity of a pump may be greatly reduced by this condition. Clean suction wells and examine intake pipes to well.

See that there is a good supply of lubricating oil on hand.

Hydrants, Open Sprinklers, and Standpipe Systems

Test all hydrants and post indicator valves. See that they are well oiled and that hydrants drain properly. Where hose is provided at hydrants it should be kept connected to outlets and free from water.

Make special examination of inside standpipes and connections, bearing the hazards of freezing particularly in mind.

Test the water curtain (open sprin-

To Keep Fire Extinguishers from Freezing—Continued

klers) before cold weather. See that valves are tight and that all pipes are thoroughly drained.

Hydrants and hose houses, post indicator valves, valve pits, etc., should all be kept free from ice and snow and should be accessible at all times.

First-Aid Apparatus

Water Barrels, Pails, and Hand Pump Extinguishers

Where water barrels, pails, or hand pump extinguishers are located in rooms subject to freezing temperatures, use calcium chloride to lower the freezing point of their contents. The following table shows approximately the temperatures at which water will freeze when calcium chloride (commercial 75%) is added in the proportions shown:

Approximate Freezing Temperature, Degrees Fahrenheit.	To make 2½ Gallons Anti-freezing Solution		
Water	Calcium Chloride	Specific Gravity	Degrees Baumé
10 .....2 gals. 1 qt.	5 lb.	1.139	17.7
zero .....2 gals. 1 qt.	6¼ lb.	1.175	21.6
10 below .....2 gallons	7 lb. 6 oz.	1.205	24.7
20 below .....2 gallons	8 lb. 6 oz.	1.228	26.9
30 below .....2 gallons	9 lb. 2 oz.	1.246	28.6
40 below .....2 gallons	10 lb.	1.263	30.2

Strength of the solution may be tested by using a hydrometer to determine the specific gravity. This is necessary in the case of a solution which has been standing a long time, or which has been made from calcium chloride not freshly opened.

Close-fitting covers on calcium chloride solution containers will help to preserve the solution. The inside of all containers for calcium chloride solution should be coated with asphaltum paint.

Calcium chloride is recommended in place of common salt because the latter will always rust metals and may become objectionable because of its tendency to "creep" and crystallize all over the receptacle. In an emergency, common salt (not rock salt) may be used when the solution is kept in wooden casks and where temperatures lower than zero F. will not be encountered. Use 2¾ lb. of salt to each gallon of water producing a solution having a specific gravity of 1.205. Salt solution must never be kept in metal containers.

Chemical Extinguishers (Soda-Acid and Foam Types)

Anti-Freeze Extinguishers normally employing solutions which will withstand temperatures as low as 40 degrees below zero require no special attention in cold weather. When extinguishers are not of the anti-freeze type (i.e. are either of the soda-acid or foam type) the following cautions should be observed:

See that no extinguishers of these types are exposed to temperatures lower than 40 degrees F. Diluted sulphuric acid may freeze at a higher temperature than water; and at from 36 to 38 degrees F. there is likely to be material precipitation in the soda solution. Low temperatures may also produce a noticeable retardation of action even though precipitation is not evident. The freezing point of the soda solution is practically that of pure water.

Absolutely prohibit the addition of "non-freezing" compounds *of any character* to the contents of these extinguishers. Extinguishers have frequently been rendered inoperative by this means, and fatalities are on record, due to bursting of extinguishers as a result of corrosion induced by such treatment. The addition of salt or calcium chloride to the soda solution causes chemical changes which defeat the essential principle of operation of these appliances.

Frostproof cabinets for chemical extinguishers, even when they contain some heating unit, should be provided only in consultation with the inspection department having jurisdiction. Expert opinion is necessary in each case as to the conditions under which such cabinets may safely be used.

General Precautions

Instruct the night watchman thoroughly in the use of all fire apparatus, the operation of all valves, and the proper method of giving an alarm. Employ only able-bodied and intelligent men of good character in this important position.

Place thermometers in the colder portions of the plant and keep close watch upon temperatures during severe weather.

Have all broken windows and skylights repaired and all outside doors made thoroughly weathertight. See that no attic ventilators are left open to the outer air.

Secure maximum efficiency from available heating equipment by having all boilers and flues cleaned before winter arrives.

To thaw water pipes that have become frozen, wrap the frozen section with cotton cloth and pour hot water upon it until the ice in the pipe gives way. Rags on the floor at the base of or under the pipe will absorb the waste water. If the freezing is too severe to yield to this treatment send for a plumber, or for an experienced sprinkler fitter, if automatic sprinkler piping is frozen.

Good results have also been secured by use of electricity where proper apparatus was available.

A burning match, torch or open flame of any description should never be employed to thaw pipes. To wrap the pipes with oil-soaked rags and set them on fire is worse than folly; it is incendiarism. Pipes are almost invariably adjacent to walls or partitions where there is an ascending current of air to feed and spread a flame. Even if the flame does not start a fire its sudden local heat may cause the pipe to break and flood the premises.

Make sure that yards around buildings are kept clean and in good order. Obstructions such as lumber and miscellaneous storage, at all times undesirable, may interfere very seriously with the handling of hose streams in a fire occurring after a heavy snowfall, particularly at night.

At all times consult and co-operate to the utmost with the inspection department having jurisdiction. Also do not fail to call upon your local fire department for advice and help.

(Courtesy of National Fire Protection Association, Boston)

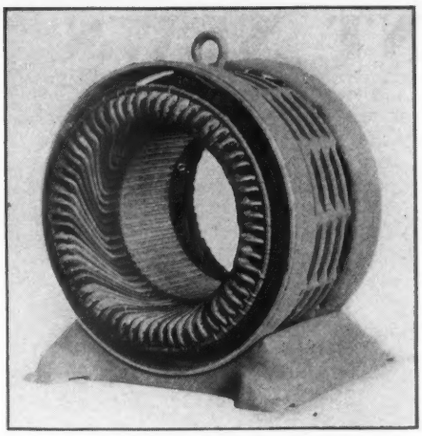


Figure 1. How coil ends are braced and supported by fastening them to tie rings

Mechanical Clearances for Motor Coils

Unless end windings are properly supported and braced early failure may result

A. C. ROE

CONTINUING from the November issue the discussion of methods of insulating and bracing coils and connections, care must always be taken to see that all sections have sufficient insulation applied to them. It will be necessary to cut sheet material into odd-shaped pieces to protect rough or irregular places on the winding. In any event apply a wall at least as thick as indicated in Table II in the preceding article.

Tie rings and ring supports are also used either separately or in conjunction with wood blocks and tying of the coils. With open-slot stators where the winding consists of completely insulated coils one tie ring should be used on each end of the winding, as in Figure 1. When the overhang of the coil (dimension *T* of Figure 1 in the preceding article) is from 4⅜ to 12 inches, these rings are applied after all coils are in place, and before connecting up the lead end of the winding. Use an eight-strand twine, or torpedo twine having a diameter of 3/32 or ⅛ inches for medium-sized stators (up to 30-inch bore). A continuous length of twine should be used, and one or two turns taken around each coil and ring.

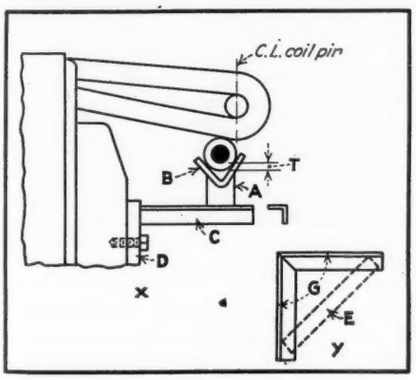


Figure 2. Construction details of typical coil-bracing arms

When the overhang exceeds 12 inches use two tie rings at each end of the winding. Place the outer rings as close as possible to the ends of the coils, with the inner ring midway between the end of the coil slot section and the outer ring. Tie each coil with three turns of twine, which should be fastened after tying six coils. If the coils are of large cross-section, tie each with separate band.

When the coil overhang does not exceed 6 inches and the ring diameter is 30 inches or less, the ring may be ⅜ inch in diameter or ⅛x⅜ inch in cross-section. If it is between 6 and 12 inches and the ring diameter is 50 inches or less, use a ring ½ inch thick. When the overhang is between 4 and 15 inches and the diameter of the ring is 75 inches or less, use a ¾-inch-thick ring. Rings more than 75 inches in diameter should be 1 inch thick.

Figure 3. A double row of tie rings is used on this large stator

(Continued on advertising page 54)

EQUIPMENT NEWS

Gage

Liquid. For industrial process work. Operates on hydrostatic principle. Liquid in tank is connected by copper tubing to bellows-type metal diaphragm linked mechanically to indicator of gage. As tank is filled diaphragm expands, linkage moves indicator, and reading on dial shows quantity in terms of gallons, pounds, barrels, inches or other desired unit. Gage may be calibrated to show correct volume in any specific temperature. When liquid is under vapor pressure, compensation is obtained by connecting diaphragm housing with top of tank containing liquid by means of copper tubing. Built to measure liquids in tanks ranging in capacity from 300 to 3,200,000 gal. Will measure any liquids except those tending to form solid mass when standing, or those which attack phosphor bronze diaphragm. Imperial Electric Co., Akron.

Oils

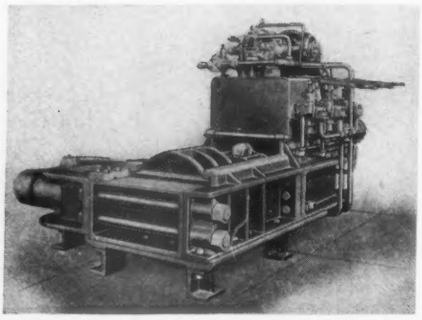
Extreme-pressure, gear. Addition to "Sta-Put" line. Produced for heavy-duty gear lubrication which demands high viscosity with extreme pressure characteristics. Claimed by manufacturer capable of withstanding 3 to 5 times load that straight mineral oils of same type will carry. Also claimed that actual torque readings show frictional losses of 30 to 50 per cent less than with the same oils before treatment. Range covers all requirements from those of light-duty speed reducers to heaviest worm or herringbone-type speed reducers operating under shock loads. E. F. Houghton & Co., 240 W. Somerset St., Philadelphia.

Dust Filter

Type EC. Has features similar to previous design, but claimed to employ greatly simplified construction for easier access and reduced maintenance. Uses more filter cloth. The W. W. Sly Mfg. Co., 4700 Train Ave., Cleveland.

Melting Pot

Redesign of Model MP-45 lb. electrically heated bath for tin, solder, or hard melting work. Principal changes are redesign of switch and plug box to facilitate connecting to circuit, use of strip heaters with both sides smooth and free from joints or corrugations in place of the old unit which was clamped to the pot. New heating units are pushed into tubes cast into bottom of pot, giving means for heat conduction independent of clamping screws, nuts, or bolts. Harold E. Trent Co., 618 N. 54th St., Philadelphia.



Baling Press

For scrap metal. Box-type, incorporating H-P-M hydro-power principle of operation. Self-contained. Has motor-driven power unit mounted directly on press. Press consists of box built up of ribbed steel castings to take loose scrap metal. Closed by hydraulically operated sliding door. Pressure applied from both end and side by platens operated by hydraulic rams. Lever-actuated valves control application of pressure. The Hydraulic Press Mfg. Co., Mount Gilead, Ohio.

Valve

Water-control. Known as Model 66. Primarily designed for air-conditioning work, but applicable in other fields where brass construction is not affected by liquid or gas to be controlled. Also for air control. Based on by-pass principle for opening main valve seat. Plunger is stainless steel, strainer monel metal. Diaphragm of reinforced composition. By-pass and main valve seat are rubber composition. Available for ½- or ¾-in. pipe connections. Height, 6½ in.; width, 4⅛ in.; depth, 3¾ in. Claimed to pass 1,500 gal. of water per hour at 45-lb. line pressure, without back pressure. Automatic Products Co., 121 North Broadway, Milwaukee.

Outlets—Switch Boxes

"Center-pri." Have slotted openings in centers of knockouts so placed that insertion of screwdriver and upward and downward prying remove knockouts. Knockouts removable from either inside or outside of box. National Electrical Products Corp., Fulton Building, Pittsburgh.

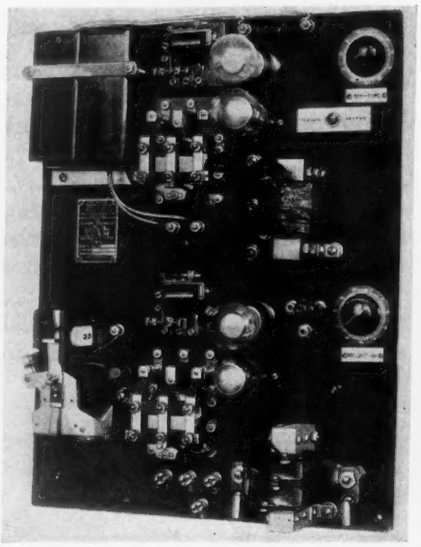
Material

Claimed hardest ever produced by man. Called Norbide (Norton Boron Carbide). In two forms: powder for use as abrasive in grinding and lapping operations; molded for use in parts that must have extreme abrasion resistance, hardness, smoothness, and wear resistance. Powdered form available in variety of standard grain and flour sizes as fine as No. 800. Norbide is self-binding. May be molded without bonds or cementing material into homogeneous, one-phase crystalline body. Resists corrosion, is unaffected by all solutions of acids and alkalis, both concentrated and dilute, oxidizes but slightly even at 1,000 deg. C., is lighter than aluminum, has coefficient of expansion of 0.0000045 per deg. C., compressive strength of 260,000 lb. per sq.in. Norton Co., Worcester, Mass.

Water Purifier

Called "Super-Settler." For assisting in rapid separation of solids and liquids in water and industrial waste treatment. Provides means for rapid and positive sludge removal. Design is based on accurate control of the various flows and accelerated handling of the liquid. Manufacturer claims equipment requires space approximately one-third volume required by settling basins equipped with sludge removal mechanism. Entire sludge removal mechanism may be lifted out and later put back into tank without stopping flow through the apparatus. International Filter Co., Chicago.

Weld Timer



Automatic, repeat. For use in connection with resistance welding machines in which electrodes of welder are air- or motor-operated. Timer is same as standard EC&M automatic weld timer, except it has additional timing circuit for governing length of time electrodes are separated to allow work to be moved to new position. Separate electrical circuits, each adjustable and independent, give control, one of weld time, other of off-time. Double-throw snap switch permits timer to be set for automatic repeat operation or provides single-shot operation for trial welds and similar temporary operations. Called EC&M Automatic Re-

peat Weld Timer. The Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland.

Speed Reducers

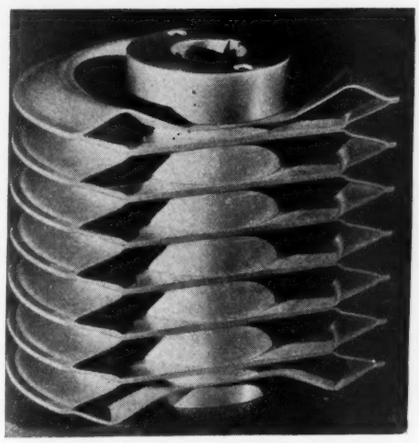
Gears & Forgings, Inc., Cleveland, in receivership since April, 1932, has effected a reorganization under name of Ohio Forge and Machine Corp. Will operate former Ohio Forge and Van Dorn Dutton divisions of Gears & Forgings, Inc., located on adjoining properties at Cleveland. Standard line of speed reducers formerly marketed under the G & F trade-mark will continue to be manufactured in Cleveland plants as heretofore. New company will also be equipped to handle all types of gearing, power transmission equipment, speed reducers, special machinery, drop forgings, and general forging.

Horn

Electric-air. For use as fire siren or signal device. Steam or compressed air piping unnecessary. Sound-producing member is vibrating diaphragm operated by direct attached motor-driven compressor that furnishes air as required. Horn is equipped with relay for connecting into fire alarm, paging, and other signalling systems. Code signals may be sent on timing of one to two seconds per impulse. Can be furnished for 12-, 24-, or 32-volt storage battery operation and for 110- and 220-volt, a.c. or d.c. supply. Federal Electric Co., 8700 So. State St., Chicago.

Sheave

For V-belt drive. Called Duro-Brace Texsteel Sheave. Has outside walls reinforced by convex steel plate, welding at rim and web, and interior grid-type construction. Allis-Chalmers Mfg. Co., Milwaukee.



Conveying Equipment

Link-Belt Co., Chicago, has announced purchase of physical assets of Bailey-Burruss Mfg. Co., 1116 Murphy Ave., Atlanta, Ga. Acquired property will be known as Atlanta Plant of Link-Belt Co.

Hoist

Electric Lift, Inc., 30 Church St., New York, manufacturer of monorail electric hoists and cranes, has moved its plant to Bloomfield, N. J. Facilities at new plant also provide for the fabrication of hand and electric bridge cranes, jib cranes, etc.

Trucks

Gas-operated, tiering, fork. Called Type GER. Designed particularly for use with the Elwell-Parker pallet system of material handling. Provides for use of ram, two or more forks, and other accessory attachments for picking up load on pallet or skid ahead of machine. Truck has rated capacity of 4,000 to 7,000 lb., travel speed of 6 to 12 m.p.h. Power plant is 4-cylinder motor developing 33 B.hp. when operating at normal speed of 1,250 r.p.m. Forks are detachable and side adjustable for spread. Elevation of load by means of cylinder receiving oil from heavy-duty geared hydraulic pump direct-driven from truck motor. Lowering valve manually controlled. Separate hydraulic ram powered from pressure pump tilts upright forward and backward by means of lever. The Elwell-Parker Electric Co., Cleveland.

Gear Motor

Small-motor type, eight speed. Consists of four-speed motor and two-speed gear. Also two, four, and six speed gear motors, consisting of two-speed gear equipped with one-, two- and three-speed motors, respectively. Motor may be wound for either single-, two-, or three-phase power. Gears are helical. Anti-friction bearings throughout. Speed of gear is changed by lever conveniently placed at top of gear housing. Motors are standard, horizontal, ball-bearing, shipped from stock. Resilient coupling used between motor and gear. Supplied as open, totally-inclosed, fan-cooled or splash-proof design. Century Electric Co., St. Louis.

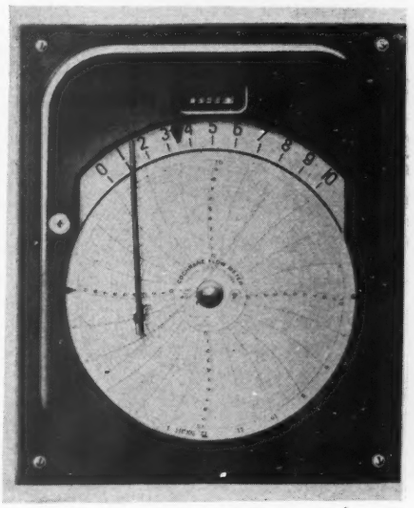
Meter

For indicating and recording both boiler water level and feed water flow. For use in boiler plants wanting both an indication and a record of these factors on the operating floor. Consists of standard Bailey fluid meter which indicates, records, and integrates feed water flow, plus a 12-in. indicator with dial-type scale for boiler water level. Both feed water flow and boiler water level recorded on same chart. Bailey Meter Co., 1050 Ivanhoe Road, Cleveland.

Furnace

Electric melting, with automatic rocking device. Type GM. Designed to increase angle of rock of furnace sheel automatically and provide for change in rate of increase to accommodate ferrous and non-ferrous materials. Equipped with transformer and control panel. Rocking mechanism provides zero velocity of shell at point of reversal. Electrode clamps are water-cooled. High-temperature refractory and interchangeable sheels provide for operation as production or pilot unit for brass, iron, or alloy steel. Rated 35 lb. cold charge and 80 lb. molten capacity. Detroit Electric Furnace Co., 825 W. Elizabeth St., Detroit.

Meter



Electric flow. External power from electric motor controls movement of registering mechanism through sensitive relay. Power for operation of pointer, pen, and integrator claimed constant throughout entire range of measurement. Integration of flow is performed at least once per minute. Seven interchangeable manometer tubes of different ranges provided to suit maximum and minimum rates of flow. Cochrane Corp., Philadelphia.

Truck

Elevator. Designed specifically for handling 4-in. skids on which tin-plate is shipped. Has single, compound and angle lift. Is 3½ in. high in lowered position. Width 15 in., carrying frame 24 in. long, clearance between forks 5 in. Capable of lifting loads of tin-plate up to 3,500 lb. a distance of 2¾ in. from floor. Ball bearings throughout. Barrett-Cravens Co., 3255 W. 30th St., Chicago.

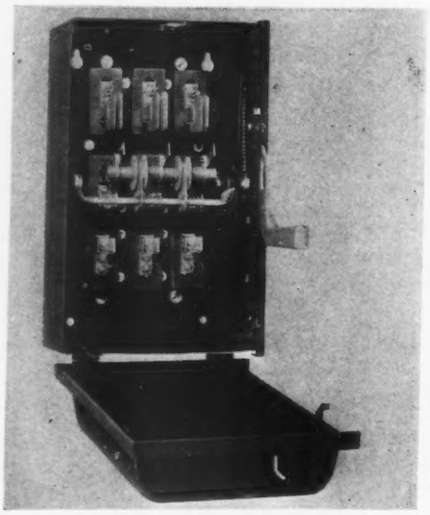
Counterpoise

Called "Super Safety Balancer." For suspending, balancing, and lifting portable tools or objects weighing up to 200 lb. Consists of tapered drum, single cable, and method of applying spring force designed to give long balanced travel. Ball bearing supports at each end of shaft. "Up" and "down" stopping points regulated by mechanically operated geneva gear. Hooks are closed-throat type. Safety latch which

engages teeth of drum prevents load from dropping in case of spring breakage. Springs adjusted for different loads by means of hardened worm. Chicago Pneumatic Tool Co., 6 E. 44th St., New York.

Switch

Thirty ampere, 80,000 series. Similar in construction to 50,000 line. Has elevated removable base for simplified wiring. Handle is front-operating, cover opens down instead of at side.



Visible blade. Obtainable as 30-amp., 2- and 3-pole fused and unfused, and 3- and 4-wire solid neutral. Square D Co., Detroit.

Meter

For recording steam flow from boiler, air flow supplied for combustion, and flue gas temperature—all on one 12-in. diameter uniformly graduated chart. Also indicates steam flow on porcelain enameled scale and integrates total steam flow on 6-digit counter. Employs direct-reading Bailey escapement-type integrator. Casing is moisture-proof pressed steel for flush front or surface mounting. Air flow mechanism adjustable to prevailing combustion condition. Bailey Meter Co., 1050 Ivanhoe Road, Cleveland.

Circuit Breaker

Heavy-duty, air. Has stationary heavy laminated brush mounted on panel. Moving arm makes contact to complete circuit. Inverted brushes at secondary and carbon contacts. Stationary latch claimed to enable breaker to withstand mechanical shock. Claimed to interrupt 14,000 amp. at 0-400 amp., 600 volts, and 120,000 amp. at 5,000 amp., 600 volts. Other claims include: Ability to carry rated current continuously with temperature rise of not over 20 deg. C. on contact; indefinite life at practically no maintenance cost. Roller-Smith Co., 233 Broadway, New York.

Valves

Renewable bronze, angle and globe. Features listed by manufacture include: Radial seat between body and bonnet drawn to tight joint by union nut without sliding or scraping surface of seat, assuring tight body joint after every assembly; disk ring composed of long-fibre asbestos, compounded with vulcanizing elements, and cured; stem of rolled rod bronze; union nut of heavy bronze; repackable under pressure; all parts of both globe and angle type interchangeable. The Fairbanks Co., 393 Lafayette St., New York.

Weld Timer

Automatic, for spot and projection welding. Type CR7993. Synchronous-motor-operated. Times power supply to welder by controlling contactor on welder. Provides range of 1/12 to 5/6 sec. in one-cycle steps (60 cycle supply). Furnished in several forms. General Electric Co., Schenectady, N. Y.

Controller

Indicating, relative humidity. Membrane-type humidity recorder combined with Rotax type contacts to form electrically operated controller. Can be operated wherever electric current is available. Maintains humidity by operating solenoid valves and motor valves on water, air, or steam lines. Relay set inside case. Can be used to operate unit heaters, control dampers, air washers, and other air conditioning apparatus. Range 0-100 per

cent relative humidity. Designed for use between 10 and 120 deg. F. The Foxboro Co., Foxboro, Mass.

Tape—Splicing Compound

"Gold Seal." Manufacturer claims friction tape is strong, "tacky," free from pinholes, non-ravelling, has high insulating qualities, and stays "tacky" long. Splicing compound is rubber insulating tape claimed to fuse instantly and become one solid mass, assuring perfect splice and complete protection. Packed in 1-, 2-, 4-, and 8-oz. rolls. Jenkins Bros. (Rubber Division), 510 Main St., Bridgeport, Conn.

Burners

Industrial, refractory screen. For heat-treating, Japanning, melting, normalizing, preheating, refining, singeing, galvanizing. Employs perforated disk claimed to give uniform controlled combustion, to insure against blow-off of flame, create turbulence which results in complete combustion with less excess air, assure constant uniform temperature at all points with no hot spots. The Selas Co., Philadelphia.

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TRADE LITERATURE

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BEARINGS—Booklet, on a new trend in bearing design, title "Let's Can the Oil Can."—The New Departure Mfg. Co., Bristol, Conn.

BELTING—Booklet, 24 pages, illustrated, on Vim Tred leather belting for short-center drives.—E. F. Houghton & Co., 240 W. Somerset St., Philadelphia.

BLOWERS—Bulletin 22:23-B10, illustrates and describes standard and heavy-duty types of blowers.—Roots-Connersville Blower Corp., Connersville, Ind.

BOILER PLATE—Bulletin, "Specifications for Chrome-Manganese-Silicon Alloy Steel Boiler Plate."—Lukens Steel Co., Coatesville, Pa.

BURNERS—Bulletin on Refrak Screen Burners.—The Selas Co., Philadelphia.

CIRCUIT BREAKERS—Catalog No. 5, on Type HD (heavy duty) air circuit breakers. — Roller-Smith Co., 233 Broadway, New York.

COAL AND ASH HANDLING—Bulletin, on boiler plant equipment including complete coal- and ash-handling systems, track hoppers, skip buckets, hoist engines, skip hoists, weigh larries, coal and ash bunkers.—The. C. O. Bartlett & Snow Co., Cleveland.

CRANES, BRIDGES—Form No. G-335, "Cranes and Transfer Bridges by Cleveland Tramrail."—The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

DIESEL ENGINES—Catalog on stationary-type diesel engines. — Ingersoll-Rand Co., 11 Broadway, New York.

(Continued on advertising page 58)

TWO PENNSYLVANIA MANUFACTURERS CUT COSTS WITH MULTIGRAPH METHODS

Wilkening Manufacturing Co.
Philadelphia

Addressograph-Multigraph Corp.
Euclid Post Office
Cleveland, Ohio

Gentlemen:

Since organizing a Multigraph Department we have been amazed at the economy and rapidity with which we are able to produce so great a variety of printing as well as facsimile-typewritten letters.

We are printing daily many thousands of glassine envelopes in which we pack individual Piston rings. Each envelope is printed with instructions and imprinted with the size of the ring contained therein. Almost every conceivable type of office form is produced in the department on varying grades of paper and cardboard.

For the Sales Department, we are producing the forms used by the field organization and are imprinting millions of pieces of literature every year for wholesalers and retailers. Sales bulletins, catalog sheets, and ribbon-processed letters for filling in are among the regular jobs which we give this department.

Very truly yours,
WILKENING MANUFACTURING CO.
George L. Bruggs
Vice-President.

GLB:AM TAW:ET

Wilkening Mfg. Co.'s Multigraph department, Philadelphia.

Addressograph-Multigraph Corporation
Euclid Post Office
Cleveland, Ohio

Gentlemen:

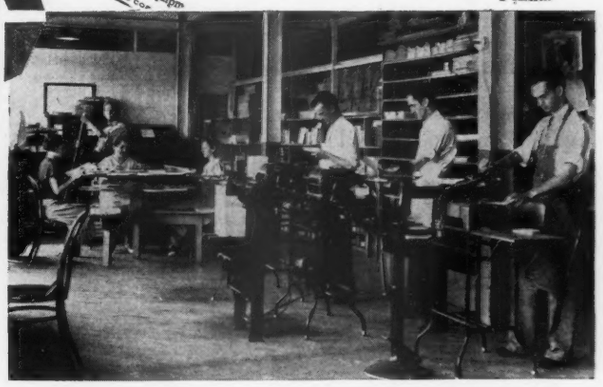
You may be interested to know that we have passed the 600,000 mark within half a year in printing and die-cutting the Octa-Glas goggle card on our Multigraph. On this job we are making a saving well over $2.00 per thousand. On this job we are surprised that this job, rather a large one for us, did not seriously interfere with the regular production of more than 270 factory and office forms, nor did it upset the steady stream of direct mail (ribbon) work which passes through the Multigraph Department.

Our Multigraph was originally purchased to imprint sales literature and circulars. We are now handling well over two thousand of these imprinting jobs each year -- quantities ranging from 200 to 10,000.

We learned soon after installing the Multigraph that it more than paid its way on imprinting alone -- but as we came to know its full possibilities, we took advantage of the fact that practically all our form printing could be done at savings of one-third to one-half of what it would cost to be done outside.

Yours truly,
WILLSON PRODUCTS, INC.
Vice President

Multigraph department of Willson Products, Inc., Reading, Penna.



From Maine to Oregon—from Minnesota to Louisiana—manufacturing organizations are cutting costs and increasing profits with Multigraph.

Speedy, economical production of factory and office forms . . . elimination of waste due to overstocking of printed matter and obsolescence of forms . . . control of quantities produced . . . Multigraph provides all these! And more—Multigraph affords the ideal method of producing dealer helps, instruction sheets and booklets, circular letters, direct mail and promotional material of many kinds, in your own offices by your own employees.

Our trained representative, who is regularly in your vicinity, will be glad to furnish you with detailed information regarding savings—comparable to those effected by Willson Products and Wilkening—which Multigraph methods can bring into your business. Consult your phone book or write us.

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THERE ARE MORE THAN 50 MODELS IN THE MULTIGRAPH LINE, INCLUDING OFFICE PRINTING, LITHOGRAPHING, TYPESETTING AND FOLDING MACHINES. PRICES AS LOW AS $145.00

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Multigraph
TRADE MARK

MULTIPLE TYPEWRITING AND OFFICE PRINTING

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OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

Unemployment Insurance Reasons for It

(*Continued from editorial page 526*)

waiting period and a long period—at most 40 weeks—for the payment of benefits, it was figured that, if funds had first been raised in 1926, there would still have been left in the fund a surplus of $24,000,000 at the end of 1932. When we think of the billion or more we are spending each year now, with a breakdown of state and local relief systems, and with the dwindling amount of private charity available, we realize how sensible it would be to build up these necessary funds when the building is good, and to prepare complete administrative plans prior to the occurrence of an emergency.

Of the psychological effect of unemployment insurance upon the employees it is unnecessary to say much. The difference between begging for relief and obtaining, as a matter of right, a portion of one's average wage is subtle and small, but to the individual it is tremendously significant. There must be taken, of course, every precaution against malingering, although the Relief Administration's experience shows that the vast majority of people prefer work to cash benefits.

Often Exaggerated

The stabilizing effects of unemployment insurance are often exaggerated. As far as industrial stability is concerned, the present unemployment reserves law in Wisconsin is designed to promote regulation of employment, but it has not been in force long enough for us to appraise its effects. There is some feeling that steady purchasing power in the form of regular cash benefits would have a noticeable effect in retarding the downward spiral of a depression. There is a strong belief based partly on foreign experience that political stability is aided by unemployment insurance because of its moral effect upon the workers covered by the insurance system.

One more condition must be met before this obvious step (toward economic security) can be taken. It must be possible to raise the necessary money without crippling our industrial life.

The best estimates as to the percentage of payrolls needed each year to build up adequate unemployment funds vary from 3½ to 5 per cent. Let us assume either that employees pay part of the cost, or, failing that, that the cash benefits are so modest that the charge upon the employers is only 3 per cent. What does that amount to? It would add to the selling cost of the product somewhere from ½ of 1 per cent to 3 per cent, a price increase which usually could be passed on without noticeable effect, or an increased cost which is minute compared to the increases in cost that have been easily absorbed in the past.

The Straw that Breaks—

By some it will be said that this is the straw that breaks the camel's back. Some will argue that even this small increase will destroy them. They can be assured that the remedy is designed to cure and not to kill.

Any wise program will plan to build up unemployment reserves as soon as industry can stand this small increased cost. It is a cost, incidentally, worth the while of industry to shoulder, for as part of the nation, industry has a vital interest in the national welfare.

While it is doubtless true that the burden, minute though it is, should be imposed only if it is bearable, let us remember that when the same increased cost is placed on everybody, no competitive disadvantages occur. The effectiveness of any action which may be taken should be postponed only if the indices of employment and business are not actively on the upgrade. Let us hope, therefore, that no postponement will be required. If we wait too long, the demand for action may be translated into radical and financially unsound proposals.

Who Will Pay the Bill?

(*Continued from editorial page 527*)

has the same degree of control over the worker as he has over the machine, then he should pay for the maintenance of the idle worker. But similar control cannot exist unless the worker is in a state of slavery.

Again it is urged that the underlying principles of the Workmen's Compensation Acts apply also to unemployment insurance. If the employer has the obligation of protecting a worker from loss of income due to an industrial accident, it is argued, he should also provide similar protection when the loss of income is due to lack of work.

But, while it may be just that an employer should provide compensation for accidents and loss of health which occur to those who work under conditions controlled by him, the chief causes of unemployment, because of existing erroneous economic concepts and destructive commercial practices, are beyond the employer's control. To make the employer responsible under present conditions, imposes a new liability on him with no compensating waiver of right on the part of the worker.

Finally it is pointed out that since companies set aside reserves to pay dividends to their stockholders in slack times, they should do the same for the workers. But the stockholders themselves, through their elected directors, set aside these reserves; they utilize their own money for this purpose; and they refrain from receiving larger dividends in prosperous times, so that they may have something to tide over less fortunate years. Applying this same principle to the creation of unemployment reserves, the workers should set aside their own unemployment reserves out of their own pay, thus voluntarily making a temporary sacrifice in the interest of later benefits.

Illogical

Hence the plan to make the employer responsible for unemployment reserves is without logical foundation and it is objectionable for other reasons.

In the first place it provides no direct means of enabling wage-earners to take advantage of the other and equally desirable forms of social insurance, except that it sets a precedent for compelling the employer to carry their cost. Such an imposition would also be inequitable.

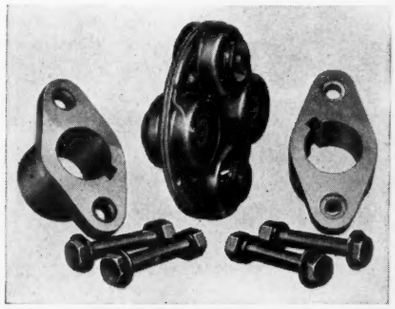
Second, since the plan imposes on the employer a direct tax without immediate returns of any kind, this tax has to be kept at a minimum, and the amount of the benefits received by the individual is so small that it does him little good and can play no important part in stabilizing business. Thus neither of the ob-

POWER TRANSMISSION NEWS

Engineer or not, the person with a mechanical bent enjoys seeing a unit which has been developed and refined to the point where maximum efficiency is obtained with an utterly simple assembly.

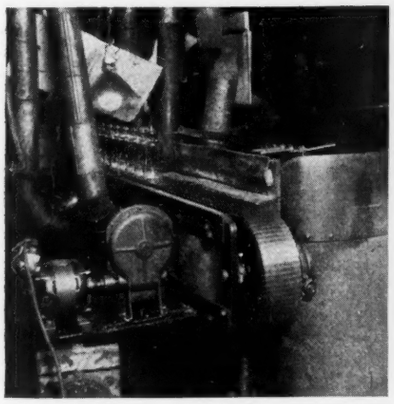
These are the chief characteristics of the Morflex Coupling, and are the reasons for its widespread use in many places.

Originally, it was developed as a universal joint to compensate for angular or parallel misalignment, and its adoption in many fields was rapid. It is now widely used in both automotive and marine service.



This illustration shows the simple assembly and the few parts which constitute this flexible coupling. The two forged steel hub members are mounted on the shafts to be connected; between these is carried the floating center, to which each hub is separately connected through a pair of resilient rubber trunnion blocks, which are set 90° apart under pressure into a 2-piece riveted housing of pressed steel. The blocks are molded over, and permanently fastened to steel cores or bushings. The outer section on the rubber block is a fabric ring, which holds it securely in the steel center. The shape of the rubber was carefully designed to give uniform stress and deflection throughout—an important feature which adds greatly to the life of the coupling.

The extreme flexibility of the unit is due to the resilient, non cold-flow rubber blocks—especially developed for this service. More than in any other coupling the design provides for misalignment and used in pairs Morflex is a perfect universal joint for shafts not in line.

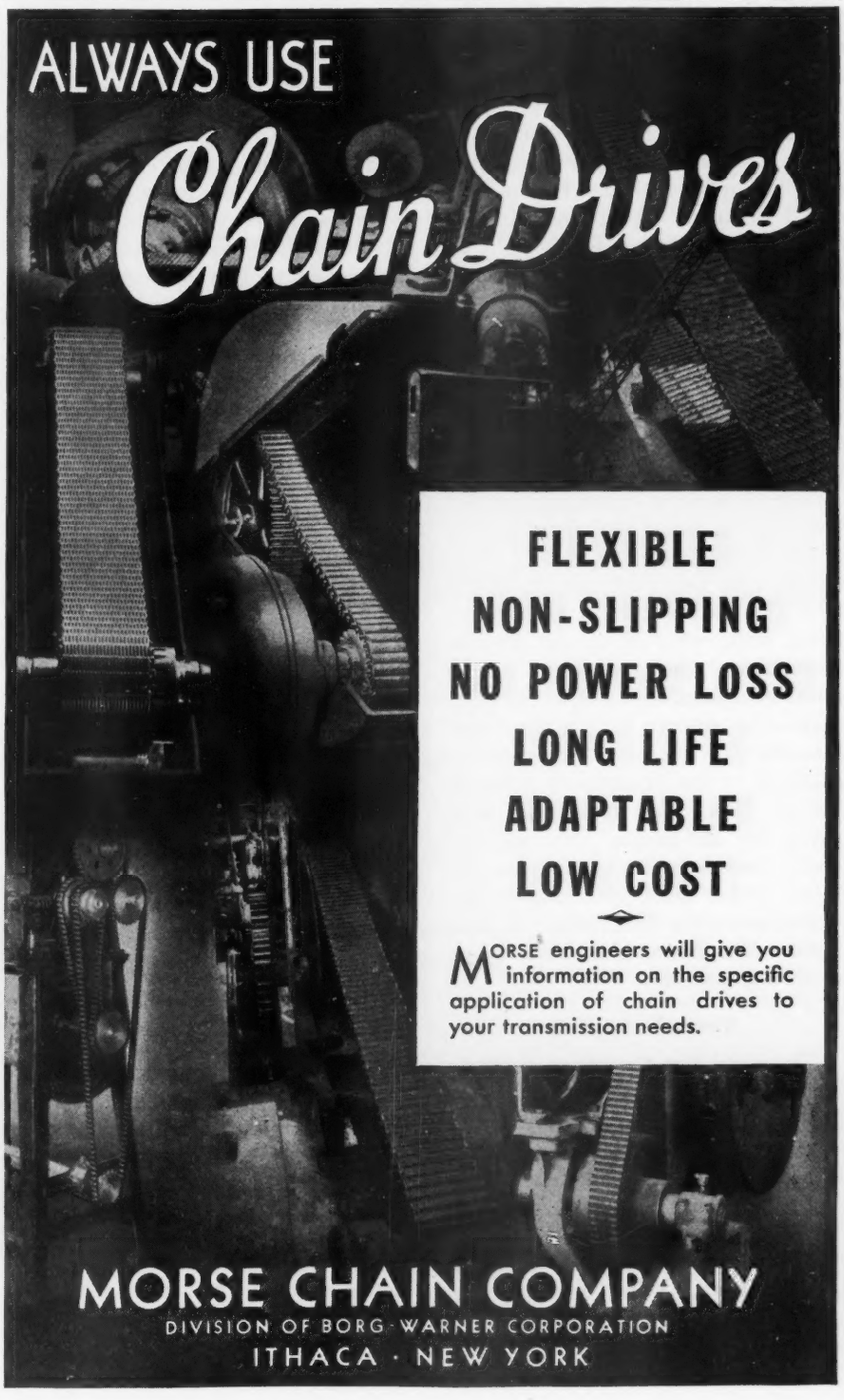


The ingenuity which characterizes the products of the glass industry has been applied to a production problem in the plant of the Obear-Nester Glass Co., East St. Louis, Illinois.

The problem was that of production-handling of hot bottles. Company engineers solved it by installing a Morse Silent Chain, connected to the drive shaft and an idler shaft—and it provides a perfect hot-bottle conveyor.

This unusual but entirely practical application of the Morse Silent Chain Drive employs a chain with ½″ pitch and 4½″ wide, traveling at a speed of 6 feet per minute.

Continuous operation for twenty years—that's the record of one Morse Chain. Commenting on Morse Chains, this user says, "This chain is hooked up to a five-horsepower motor on a line shaft running thirty-eight machines. This chain has been in continuous operation for twenty years and the way it looks today, there is a possible chance of its running twenty more years. We use this type of drive exclusively in all our plants, scattered over the country. We believe this is the best and most efficient drive. We put a few drops of oil on these chains once a month and take up on the motor once a year, with no interruption or loss of time."



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jectives of the plan is effectively met.

If employers should not pay the cost of social insurance, then who should?

Not the wage-earners—experience shows they cannot do it.

Not the taxpayers—there is no reason why this already overburdened group should be singled out to carry an additional burden for the benefit of another group consisting largely of non-taxpayers.

Who Then?

The correct principle has already been laid down, and well-nigh universally accepted in the Workmen's Compensation Acts of our various states. The cost of compensation for industrial accidents is borne by neither the employer nor the wage-earner, but is included in the cost of production. It appears in the price of the product and is paid by those who receive the benefits of the services required to create the product.

By calculating the increase in the prices of all American products in which this cost appears, it is easy to make it appear that an enormous burden is being borne by the American people. But this simply is not true. Because of the simplification of the process of collecting compensation for industrial accidents, the reduction in the cost of such collections, and, what is of far greater importance, the reduction in the number of accidents due to the stimulation of interest in "Safety First" movements, all of which can be credited to the Workmen's Compensation Plan, vast sums are being saved for our people. No one seriously questions that the plan has more than paid for itself—few would advocate the repeal of these laws. Therefore, this plan is undoubtedly sound.

Everybody Pays

The need for the other forms of social insurance has also been brought about by the development of our industrial system. The cost of them, therefore, should also be borne by those who benefit by this system; namely, the consumers of its products—and (perhaps it is unnecessary to state) by "consumers" is not meant a mythical class wholly distinct from the producing class, but *everybody*.

To pass the cost of social insurance on to the consumer, and to prevent it from being borne by some or all of those engaged in production (management, wage-earner, and investor), this cost must be included in the price for the product paid by the consumer.

But when the prices being received by a firm for its products are so low that the business runs at a loss, or when they are so high that markets are greatly restricted, the financing of any plan of social insurance is out of the question.

Hence, the formulation of a sound social insurance program must start with an analysis of the prices being received—or, more correctly, with a valuation of the services rendered by all concerned in producing the product so that proper compensation for these services can be included in the price, thereby assigning to each consumer his proportionate share of the cost of the services by which he benefits.

Enter Pricing

Each producer should establish prices for his products that will cover all the costs of enabling the business to perpetuate itself and make progress—including, among other items, adequate wages, a fair return on the capital invested, reserves for depreciation, obsolescence, research, and unpredictable contingencies, reserves for social insurance, and also a sufficient sum to cover the sales effort needed to insure a satisfactory distribution and use of products or services at these prices.

The cost of social insurance cannot be a direct burden on society—because society could not carry this burden. A sound social insurance program must, therefore, like the Workmen's Compensation program, possess the inherent capacity to pay for itself. This can be done if it accomplishes two things:

1. Stimulate the cultivation by the wage-earner of the qualities of initiative, self-control, prudence, foresight, and a sense of responsibility.

These qualities are all-important. Only through their cultivation can the average man hope to gain a comfortable position in life and continue to better it; and no nation can continue to progress unless the majority of its normal citizens are intent on bettering themselves materially, physically, and spiritually.

These qualities are also of foremost importance in production. Any plan that will stimulate their cultivation will result in an increase in efficiency that will more than cover the cost of a rational plan.

Social insurance plans which afford the wage-earner complete protection without voluntary action on his part and without effort and some sacrifice of present comfort for future benefit, are objectionable because they do not produce this increased efficiency.

2. Provide each wage-earner with the opportunity of accumulating a sufficient reserve to prove of real value in helping to stabilize business. As has already been pointed out, plans calling for a direct tax solely on employers or any other group, must necessarily be too limited in scope to provide adequate reserves.

A Sound Program

Here, sketched very briefly, is a social insurance program that meets the above criterion of soundness:

Protection is provided for the wage-earner against sickness, accident, old age, unemployment and death, at minimum cost and with maximum certainty and security. Such protection should provide maintenance at subsistence level only.

The wage-earner is given an opportunity to build up his own reserves and educated to the importance of so doing. This involves the creation of an investment fund, supervised by experts, and out of the employer's control. Each wage-earner's share must be available to him whenever needed.

The wage-earner regularly shares equally with investors in the surplus earnings of the concern—meaning by surplus earnings the sum left after all funds needed to pay proper dividends and otherwise insure the perpetuity and progress of the business have been set aside.

Four Objectives

By this plan the following objectives are accomplished:

1. All who are willing and able to engage in useful labor are provided with the means of sustaining life and preserving their self-respect.

2. To gain benefits that provide more than mere subsistence, the wage-earner must voluntarily undergo the sacrifice of saving.

3. Since the greater the surplus earnings of his employer, the greater his own reward, the wage-earner is directly interested in increasing those earnings.

4. Since all earnings, over and above those needed to compensate adequately those concerned in production and to enable the business to survive and make progress, are equitably distributed, the cause of the long-standing dispute between capital and labor is eliminated.

LOOK at the worm and gear in a Cleveland Drive. Massive. Capable. Ground to precision. Fitted so accurately that the high efficiency when new is sustained throughout life.

You will not question the value of Cleveland's exact, painstaking methods after you have run Clevelands in your own toughest spots. You will *know* then that their remarkable endurance, dependability and freedom from breakdown are the direct result of Cleveland's high standards of engineering, selection of materials, and the precision methods it has originated for its own manufacturing.

For more than 22 years, trustworthy Clevelands have won the appreciation and held the confidence of hundreds of particular users. With these customers, Clevelands are their final choice—"The Ultimate Drive." Getting better acquainted should make Clevelands *your* "Ultimate Drive," too. A Cleveland Engineer will gladly call, to begin the acquaintance or to continue it.

THE CLEVELAND WORM & GEAR CO., 3256 EAST 80th STREET, CLEVELAND, OHIO

CLEVELAND

WORM GEAR *Speed Reducers*

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—but Not with your Plant and Profits

THERE is more than a few dollars at stake when you take chances with inadequate fire extinguishers. You may lose orders, customers and profits which not even insurance can bring back.

For alcohol, lacquer, gasoline and oil hazards, LUX extinguishers will give you protection, more complete than you can get with any other type. LUX extinguishers put out flammable liquid fires burning in a tank or on a surface as effectively as foam or carbon tetrachloride units. LUX also snuffs out fires involving flammable liquids flowing through the air from leaking pipes or overflowing tanks against which foam and carbon tetrachloride extinguishers fail.

LUX smothers fire with an inert gas instead of a liquid. It is instantaneous and three dimensional in its extinguishing effect. It leaves no mess to clean up and does no damage to anything in the fire area.

Investigate LUX for your flammable liquid hazards and play safe! Write to Walter Kidde & Company, Inc., 71 West Street, Bloomfield, New Jersey.

2 Reasons Why LUX Gives Better Fire Protection

A faster rate of discharge gives the new Super-LUX extinguisher longer range, greater penetrating power and greater fire extinguishing wallop.

The new oval shaped LUX discharge horn gives a better distribution of snow and a wider blanket of smothering gas.

For All Electrical and Flammable Liquid Fires

Laying Out Individual Drives

(Continued from editorial page 557)

losses that are unavoidable with the lowered power factor caused by oversized motors.

When the power requirements of the individual machines are small, say 1 horsepower or less, it is frequently cheaper to leave them overmotored than to go to the expense of testing and changing, particularly if a change in product or methods is likely to make the installation obsolete in from one to three or four years.

Size of Motor

The second problem, selecting the best drive for the application, will have to be considered in a later article. Here the determination of the proper size of drive will be considered.

In my opinion, if one general principle is kept in mind in designing every drive from an electric motor to a driven load, a large percentage of the trouble now experienced will be avoided.

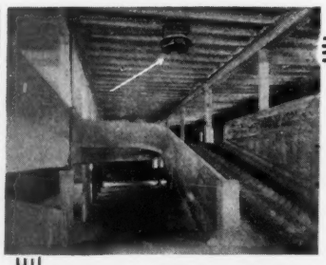
This principle is: *Consider the momentary peak loads to be expected, as well as the average load, when designing the connecting mechanism between motor and driven load.*

It is applicable to all types of mechanical transmission equipment—belting, gearing, chains, or what not. Although it seems self-evident, it is less often considered than the reader may suppose.

The laboratory research man determines with some accuracy the capacity and life of a drive under constant load. He says, in effect, "This drive will carry 5 horsepower continuously and under that load have a life which is satisfactory to most customers." He considers that he has been highly conservative if in tables published for the customer's use he makes an allowance of 25 per cent for what he calls "overload."

All too often the plant man says in effect, "A 5-hp. motor should take a 5-hp. drive." This latter assumption is often entirely unwarranted.

A 5-hp. motor develops a starting jerk equal to the steady running pull of a motor having a nameplate rat-



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1. Light weight construction (through scientific design) of the Wing Featherweight Unit Heater permits suspension of unit directly overhead in any desired position.

2. Vertical downward discharge of heated air insures penetration to, and uniform diffusion over, entire work area.

3. Taking the air from practically the highest point in room prevents wasteful accumulation of heated air at this point—resulting in greater economy of steam.

4. The Wing Featherweight Unit Heater is low in first cost, installation cost, and maintenance cost.

5. The finned tubes can be individually removed and replaced in case of accidental damage.

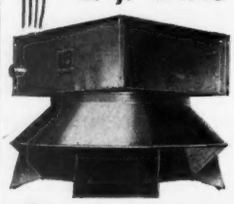
6. Being perfectly flat (no crimping) fins offer minimum resistance to air flow, and no not catch and hold dirt.

7. The scientifically designed Wing Scruplex Propeller Fan is used, in this heater. It is noted for its ability to deliver a large volume of air, from great heights, at high velocities, and against high static pressures.

8. Each heater is given a 150-lb. steam test, and subjected to 1,000-lb. hydrostatic pressure.

9. Fifty-six years of specialized air-handling experience insures a thoroughly satisfactory installation.

L. J. WING MFG. CO.
162 W. 14th St.
New York, N. Y.



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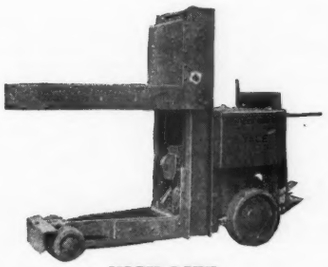

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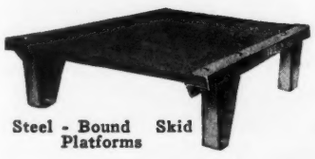
Built in Capacities up to 30,000 lbs.



Steel - Bound Skid Platforms

MULTI-STROKE
Hand Lift Trucks. Capacities up to 20,000 lbs.

TRADE **YALE** MARK

IN HORSE racing a close finish provides thrills and excitement . . . but in industry, a narrow margin between profit and loss arouses no cheers. It is a source of worry and struggle . . . a constant race against costs to get over the line into the profit column.

Waste or inefficiency in one place or another may be the difference between red and black figures on your statement.

In seeking to reduce costs and increase profits examine your present methods of lifting, hauling, stacking and storing materials. Are they slow, inefficient, unsafe, retarding production, giving competition an edge? It is in materials handling that are discovered the greatest opportunities for economy. The solution may be a Yale Hand or Electric Lift Truck and Skid Platform System.

Yale Trucks are the choice of the world's leading industries. You will find it well worth while to investigate their possibilities in your plant and one of our representatives will gladly help you do so.

THE YALE & TOWNE MANUFACTURING COMPANY
PHILADELPHIA DIVISION, PHILADELPHIA, PA., U. S. A.
Makers of Yale Electric Trucks, Hand Lift Trucks, Hand Chain Hoists and Trolleys

RCA VICTOR

Spray-Finishes with DeVilbiss Equipment

RCA Victor uses DeVilbiss Equipment in the spray-finishing of its cabinets—and the Victor Company has been a DeVilbiss customer for 21 years. This long record is further evidence of the successful results in high quality finishing that leading manufacturers are achieving with DeVilbiss products.

New and modern DeVilbiss Equipment can help manufacturers in two important ways. First, by producing better finishes that improve appearance, increase salability. Second, by faster and more efficient finishing operations, resulting in lower production costs.

Near you is an experienced DeVilbiss representative, well qualified to show how the latest developments in DeVilbiss Spray-Finishing and Exhaust Equipment can be of definite value to you. Call him in now, or write us direct.

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New York *Philadelphia* *Cleveland*
Detroit *Chicago* *St. Louis*
San Francisco *Windsor, Ontario*

Direct sales and service representatives available everywhere

DeVilbiss

ing of 6½ to 10 horsepower and operated at rated capacity.

As the speed increases the turning force of most 5-hp. motors grows until about 70 per cent of full speed is reached. At this point they are exerting the normal turning effort of a motor of 10- to 25-hp. rating operated at full load. The exact figure for any given motor depends upon the type, speed, and individual design.

Before stalling, a 5-hp. motor will deliver momentarily 2 to 5 times full-load effort. In their momentary demands for power many individual drives approach the stalling point of the motor more or less frequently.

When starting, the drag on a motor may exceed the load that must be transmitted by the belt, chain, gears, or whatever connects it to the driven machine. This is because some power is absorbed in bringing the motor's rotor up to speed. The rotor is a small flywheel in itself, and considerable power is required to speed it up in a hurry. Hence, a simple motor test does not always indicate the load on the mechanical transmission device.

For Small Motors

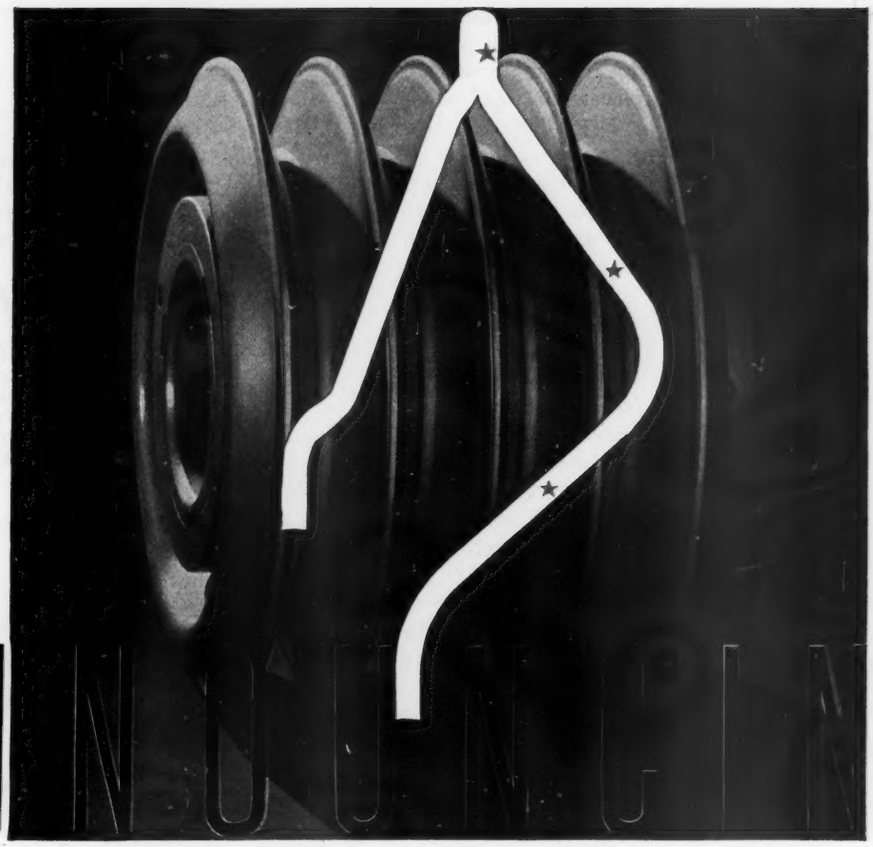
Perhaps the last few paragraphs have seemed rather academic. Let me bring their meaning closer home.

If you will study the motor manufacturer's table of standard pulleys and recommended minimum sizes for standard general-purpose motors, you will note that the drives seem to be planned much more amply for small than for large motors. The reason is not obscure. A belt drive must carry the motor starting jerk and the large overloads present during the speeding-up period.

Small motors, 5-hp. and below, are almost universally started "across the line." They start with a heavy jerk. Larger motors are more often started with a compensator or some sort of a starter that reduces the starting jerk.

When, a few years ago, linestart motors were introduced in sizes of 7½ to 30 horsepower for general use, there was an epidemic of drive trouble. Users could not understand why it was not feasible to belt a 20-hp. linestart motor the same as a 20-hp. compensator-starting motor had been belted in the past.

On severe applications the belt came off; in less severe services the



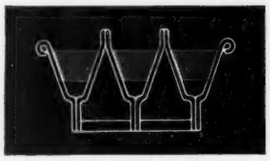
ANNOUNCING!

The new
DURO-BRACE TEXSTEEL SHEAVES

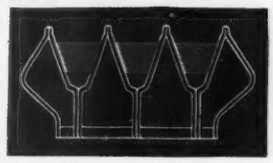
The Allis-Chalmers Manufacturing Company, originators of multiple V belt drives, now offers a new development in sheaves which will withstand the severest duty. • Bending of the outside plate is practically impossible with the new Duro-Brace Sheaves, for in the new design this vulnerable area is braced by a reinforcing convex steel plate, which increases its strength to so great a degree as to eliminate distortion, even under extreme overloads; thus giving a true running drive always. • Duro-Brace Texsteel Drives are 98.9% efficient . . . Require no belt dressing or lubrication . . . Are unaffected by moisture or dust . . . Are Vibrationless, Slipless, Silent, Light and Clean. • Mail us a card asking for Bulletin No. 2188 which sets forth the advantages which Duro-Brace Texsteel Drives offer you in all matters of power transmission, whether they are simple or complex.

★★★

Former Design: cross-section showing unsupported outside plate.



New Duro-Brace Design: cross-section showing outside plate braced by a convex reinforcing steel plate.

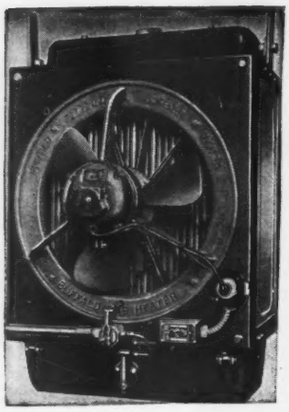


TEXROPE DRIVES

ORIGINATED BY
ALLIS-CHALMERS MANUFACTURING

ALLIS-CHALMERS
COMPANY · MILWAUKEE, WISCONSIN

Clean, Cheap, Convenient HEAT



with Buffalo GAS UNIT HEATERS

In hundreds of shops, large and small, Buffalo Gas Unit Heaters have solved the heating problem. These shops now have uniform, controlled, forced circulation of warm air of the temperature desired, with automatic, money-saving controls which prevent waste of fuel.

Quickly and Cheaply Installed

Buffalo Gas Heaters require only connection to gas line, electric current and the application of a match—and they begin to HEAT! They require no fuel storage—or ash heap. They are odorless, dustless and smokeless—and no fireman or engineer is required to operate them.

Used for heating every kind of shop, store, office, garage, storage building, etc. Full approval of Fire Underwriters.

Also STEAM Units: Buffalo manufactures a complete line of floor and suspended steam unit heaters also.

Write for Bulletin: Before you buy any heating equipment send for Buffalo Bulletin No. 469 which describes the entire line. Complete ratings included.

Buffalo Forge Company
471 Broadway, Buffalo, N. Y.

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

WRITE FOR BULLETIN 2852— Gives full details on all Types

belt had to be run so tight that stretch was rapid, and unduly frequent take-up and frequent belt replacement were necessary.

Regardless of the users' understanding or lack of understanding of the fundamentals involved, they had to use larger belt and pulley sizes, to avoid intolerable maintenance costs.

With certain other types of mechanical transmission equipment, conditions are somewhat different. Occasionally a user says, "Steer clear of silent chains, or V-belts, or gear reducers (as the case may be) on linestart jobs." Silent chains, or V-belts, or gear reducers cannot "come off" as flat belts do when unconscionably overloaded at starting or by momentary peaks, but under such misapplication their life is short, performance is unsatisfactory, and repairs are high. However, if such drives are proportioned with due consideration for the severe starting loads imposed by linestart motors, the same drive performance that these forms of mechanical transmission have given on the more familiar motor types in the past will be obtained.

The resulting drives may look disproportionately large to an eye trained by previous experience, and they may produce sharp twinges in the region of the pocketbook, but they must be used if long trouble-free service is essential.

There are applications, of course, where the short, jerky start will cause trouble with the driven machine, such as certain types of textile machinery, and old, lightly designed machines of other kinds. In such instances, the starting effort of the motor must be reduced by a compensator or other starting device.

To Set Up Standard Costs

(Continued from editorial page 542)

should in all cases be shown separately from those controllable by him, both to facilitate budgeting and to fix departmental responsibility for the reduction of the controllable element.

This plan of setting standards gives an effective control of expense

The material that defies corrosion

HAVEG

CHEMICAL EQUIPMENT
FUME DUCT SYSTEMS
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AGITATORS

HAVEG CORP.
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Dolph's

BIG 3

for motor maintenance

1. CHINALAK

A railroad in Oklahoma recently reported ". . . . DOLPH'S CHINALAK BLACK BAKING VARNISH has increased the average life of our motors by over 300%." This is but one of many endorsements from all branches of industry.

Maintenance engineers have proved that it pays to discriminate in the selection of insulating varnishes. They have learned that to specify CHINALAK is an assurance of the finest motor insulation obtainable.

2. ELECTRIC LACQUER

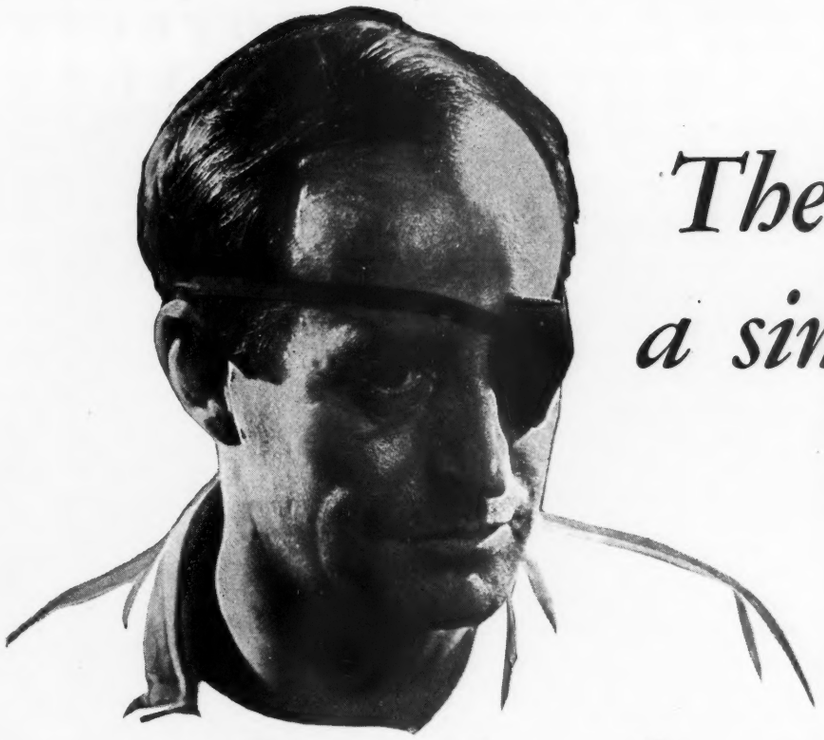
For 25 years the standard black finishing varnish—oil and waterproof.

3. RED OILPROOF ENAMEL

Affords definite protection against oil creepage on commutators.

Literature describing these and other DOLPH products will be mailed on request.

JOHN C. DOLPH CO.
Insulation Specialists
168 Emmett Street Newark, N. J.



The cost of a single Eye

buys Goggles for 1000 men

EVERY 60 SECONDS an eye accident occurs—more than 300,000 every year, costing employers some $50,000,000. Eyes are expensive; the cost of a single serious eye injury, in compensation, lost time, medical and hospital expenses might easily wipe out a whole year's savings effected by a new production machine or process in your plant.

Yet—the cost of eye protection is negligible. *For the cost of a single sightless eye you can give a thousand men the surest, safest eye protection known to industry—the security of AO goggles.*

American Optical Company makes a complete line of goggles for every eye hazard. They are strong, cool, comfortable, allow full vision and can be exactly fitted to the needs of the man and the job. At the American Optical Company branch office near you, an AO industrial representative is ready to demonstrate the qualities of AO goggles and to help you work out a practical and highly profitable eye-saving program. Call him in today.

The AO DURALITE "50" is light, cool, comfortable. Its fuss-proof bridge provides easy, *permanent* adjustment to any face. Super Armorplate lenses offer greater resistance to impact than any other standard lens.

American Optical Company

Manufacturers, for more than 100 years, of products to aid and preserve vision. Factories at Southbridge, Mass. Branch offices in all principal industrial centers. In Canada, Consolidated Optical Co., Ltd., Toronto.

1350

"ANCHOR" PULLER-HOIST

Patent Pending
1½ ton capacity. Complete with 15 ft. load chain and overhead control; weighs 45 lbs.

Price $24.00
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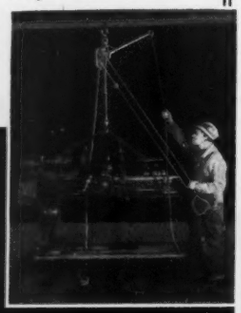

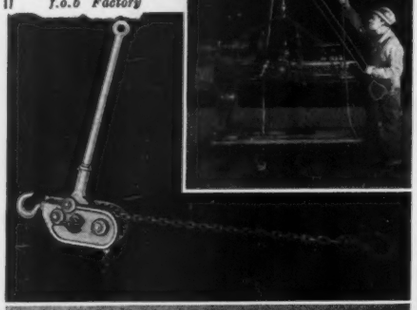

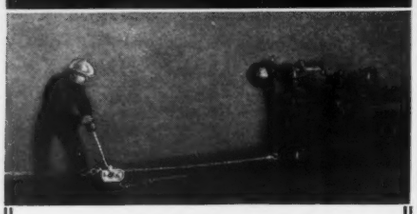

A COMBINED PULLING JACK & CHAIN HOIST

A one-man outfit for pulling, moving, lifting heavy loads. Is automatic reversing. The handy-man tool for many odd jobs in maintenance, repair, construction and production work. Shipped on 10 days trial.

EDELBLUTE MANUFACTURING CO.
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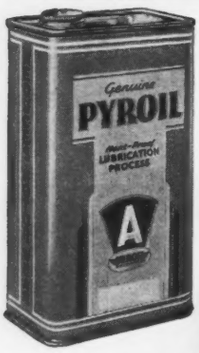

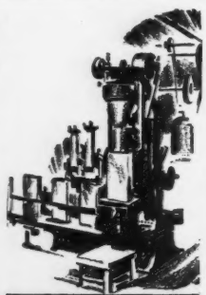

Genuine
PYROIL
SAFEGUARDS MACHINERY CUTS EXPENSE

Simply add Pyroil in small quantities to regular greases and lubricants for a process of protection to all metal, and an efficiency in operation, not gained in any other manner.

Pyroil impregnates the metal, coating it with a slippery, glossy surface which serves as an impregnable lubricant in conditions of emergency and extreme pressure. Cuts friction considerably. Reduces fire hazards.

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variations due to departure from standard. But suppose the variation is not in overhead but in volume? The old theory was to distribute each month's or period's burden against the next period. This balanced the books and pleased the bookkeeper, but produced a cost that jumped up just when volume was reduced and when the manager felt the urge to sharpen his pencil and bring back some of the lost business. The plan was thoroughly unscientific and has largely been abandoned by progressive accountants.

There are two ways of disposing of these volume variances. One is to set up as normal or standard the expected production for a period and to charge or credit to a variance account any under- or over-absorbed burden resulting from failure of these expectations. The other plan, which comes out to pretty much the same thing in the end, is to transfer volume variances to profit and loss, either directly or through an intermediate account. In either case, the persistence of a non-equalizing variance will mean a revision of the burden rate.

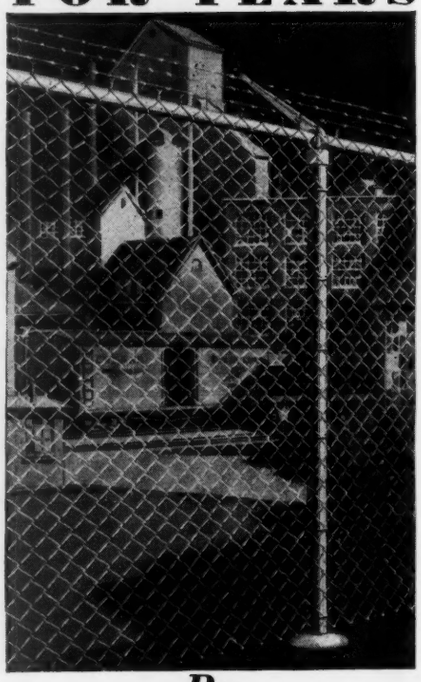
Most Useful Feature

All these variations, direct and indirect, may be summarized and analyzed in variance reports, which are perhaps the most useful features of a standard cost system. Figure 3 shows a form of variance report used in a textile mill. It gives a summary of operating results in terms of degree of conformity to standard that clearly indicate the points at which attention is needed.

Reports to department heads will follow the same principle, but will be even simpler. Any set of expenditures may be analyzed in appropriate variance accounts. Frequently a daily report will be made, listing in detail all variations from labor and material cost. A monthly report will summarize these direct costs and will analyze the department-burden budget variances.

These daily reports are of immense practical help. Suppose a lot of hard castings gets into the shop. Ordinarily the machining of these castings would present nothing unusual to catch the attention of the foreman, and the workman would make the best of the situation without protest (except on piece rate, which is really a standard-cost plan

PROTECTED FOR YEARS



By
CYCLONE FENCE

NOT ONLY does Cyclone Chain Link Fence assure added safety at a price far below the losses suffered from fire, theft and accident, but it also gives every feature you should demand in a fence.

Consider these advantages: *Exit* and *entrance* of visitors, employees and trespassers are absolutely within your control, outdoor storage space may be added to your property with security and the possibility of liability suits resulting from accidents to outsiders will be eliminated when your property is surrounded by strong Cyclone Chain Link Fence.

You have no construction worries or problems. The entire job from accurate estimate to final expert erection is carefully handled by the factory trained experts of a Company with a record of nearly half a century of superior service.

Complete information furnished on request. Write for catalog, no obligation. Address Dept. F.M

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General Offices: Waukegan, Illinois
SUBSIDIARY OF UNITED STATES STEEL CORPORATION
BRANCHES IN PRINCIPAL CITIES
Pacific Coast Division:
Standard Fence Company
Oakland, Cal.
Cyclone—not a "type" of fence, but fence made exclusively by Cyclone Fence Company and identified by this trade-mark.

YOUR COMPETITOR MAY BE SMARTER THAN YOU think

HE has found a way to clip minutes from his materials-handling schedules—to clip dollars from his materials-handling costs.

He has the advantage, unless *you* too have capitalized on our long and varied experience by consulting with Elwell-Parker Engineers on your own need for greater savings in handling materials.

Example: this New Elwell-Parker Tier Truck takes big unit loads, built up on light, inexpensive pallets; travels swiftly through narrow aisles, low doors; tiers to warehouse roof; takes down, delivers to freight car or truck.

Load on pallets at plant; ship on original pallets; then discard pallets.

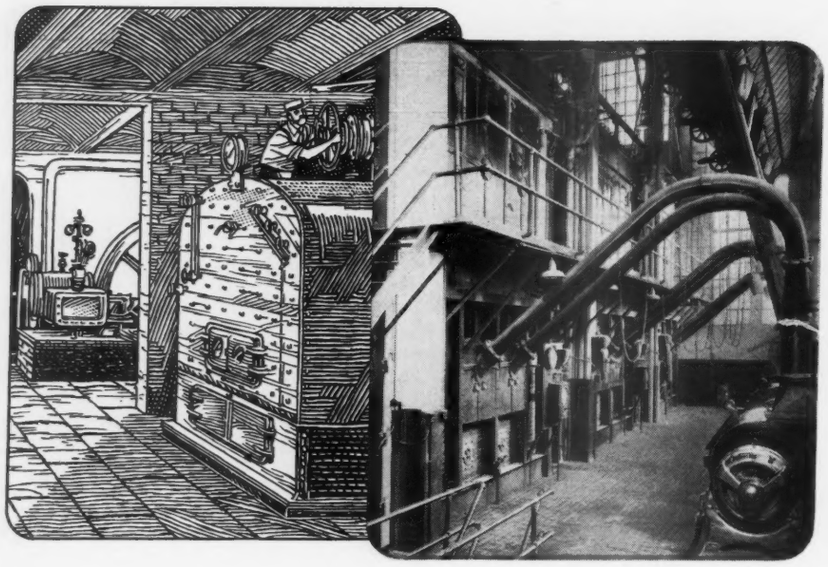
Your choice of power (electric, gas, gas-electric) and attachments to save the most money in your own work.

The Elwell-Parker Electric Company, 4323 St. Clair Ave., Cleveland, Ohio.

New ELWELL·PARKER *fork trucks*

INDUSTRIAL POWER TRUCKS

Through Forty Calendar Changes

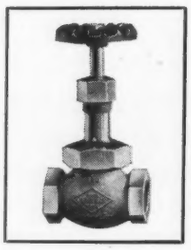


"We have been using Jenkins Valves for over forty years, and believe that some of these have been in service since our first steam operation"
Albrecht Manufacturing Co.

FORTY years ago! Why, within that time the whole world has changed. Aircraft and submarines, radio and talking pictures, automobiles and motor-ships, refrigeration and air conditioning, streamlined trains and eighty story buildings, were only the vague dreams of visionaries when Albrecht first bought Jenkins Valves.

Yet through these four decades of ceaseless change Jenkins Valves have kept pace with industry's ever changing demands, and have maintained a steadily growing reputation for integrity. Jenkins Valves today, as in the past, are notable for advanced engineering, sound construction, and extraordinarily satisfactory service.

How Jenkins Bros. is paralleling engineering and industrial progress with advanced valve design and new valve types is convincingly portrayed in the new Jenkins Catalog No. 23. In contrast to the comparatively few types and patterns available to the valve buyer forty years ago, this catalog shows approximately five hundred different valves. There is a trustworthy "Jenkins"—of bronze, iron, or steel—to meet the needs of 1935.



Jenkins Bros

JENKINS BROS., 80 White Street, New York, N.Y.; 510 Main St., Bridgeport, Conn.; 524 Atlantic Avenue, Boston, Mass.; 133 No. Seventh St., Philadelphia, Pa.; 822 Washington Boulevard, Chicago, Ill.; JENKINS BROS., Limited, Montreal, Canada; London, England

JENKINS VALVES · SINCE 1864 · BRONZE · IRON · STEEL

of payment). But with standard costs the increased machining time will be caught by the office before the next day, by comparison with standard, and reported the next morning to the foreman; the rest of the lot can then be sent back to be annealed.

With such a cost system it is practicable to give a competent department head far more responsibility. In some companies, operating departments are charged with rent, depreciation, and other expenses pertaining to their departments, and are given a voice in the replacement of their equipment and layout, and in the management of their departments, so that the foreman or superintendent accepts the responsibility for earning fixed charges on the machines purchased at his recommendation or with his approval.

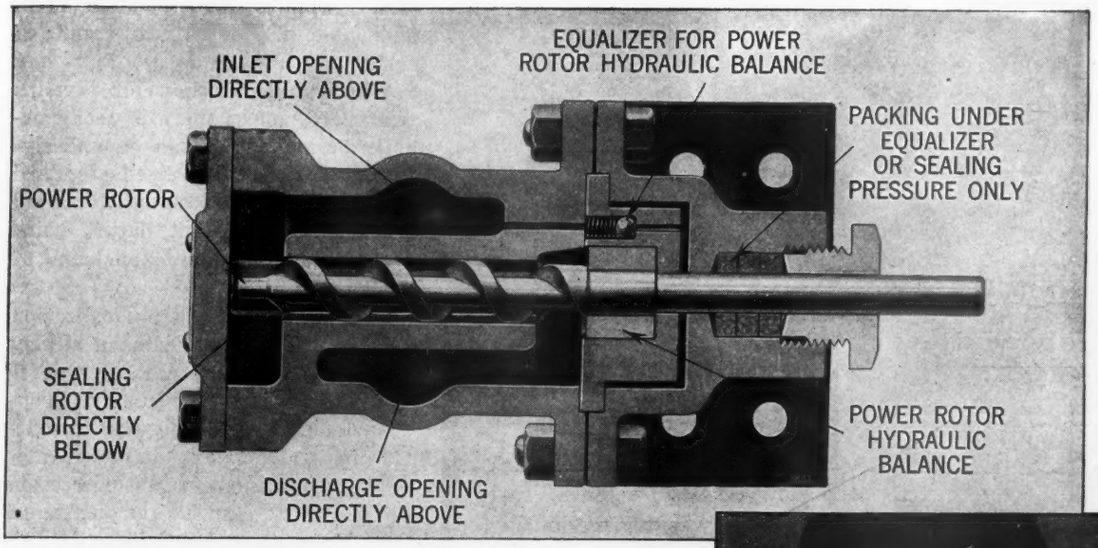
Definite Responsibility

A standard cost system is no stronger than the standards on which it is based. Clearly, budgets will mean little but bickering in a factory where responsibilities are not clearly fixed and where one department can shift a part of its expense, unnoticed, to another. A clearly defined outline of organization responsibilities and an adequate control to prevent unauthorized or unaccounted expenditures are essential.

With such control, the setting of standards may proceed along familiar engineering lines. A staff study should be made to determine and record the best method of performance. This may be the present method, or an improvement on it. In product design, this study will be made by the engineering department; in process analysis, by the motion-study and layout engineers.

When the best methods have been established, the cost requirements in terms of quantities of material or units of time will be carefully measured, by making up samples, by tests or time studies. It may be necessary, if the standards involve changes from present methods, to allow time for training in the new methods and to use a higher cost allowance in the interim.

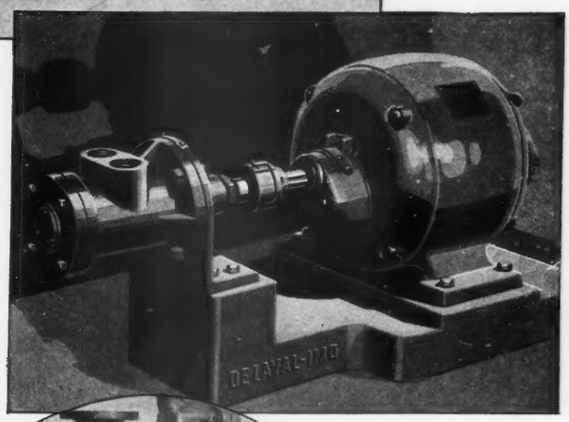
When quantity allowances have been determined, for either materials or time, the next step is to set standard prices. For labor, this will result in a piece rate or some other form of payment allowance. For ma-


INLET OPENING DIRECTLY ABOVE
EQUALIZER FOR POWER ROTOR HYDRAULIC BALANCE
PACKING UNDER EQUALIZER OR SEALING PRESSURE ONLY
POWER ROTOR
SEALING ROTOR DIRECTLY BELOW
POWER ROTOR HYDRAULIC BALANCE
DISCHARGE OPENING DIRECTLY ABOVE

● Sectional plan of De Laval-IMO pump.

Rotary Displacement

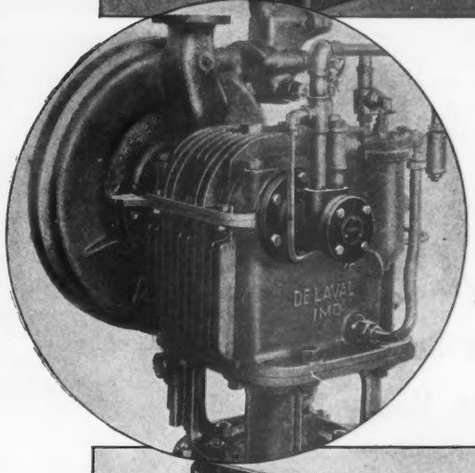
PUMPS FOR LUBRICATION



THE DE LAVAL-IMO PUMP

here shown has but two moving parts, a power rotor with extended shaft for connection to the driving shaft and an idler or sealing rotor meshing and synchronizing with the power rotor. There are no pilot gears and no separate bearings, and but one stuffing box. The discharge is continuous and without pulsation and no valves are required. The pump can be coupled directly to an electric motor or a steam turbine, or to a shaft of any machine to which lubrication is supplied. Because of the high efficiency of the De Laval-IMO pump, little power is consumed and there is less heating of the oil.

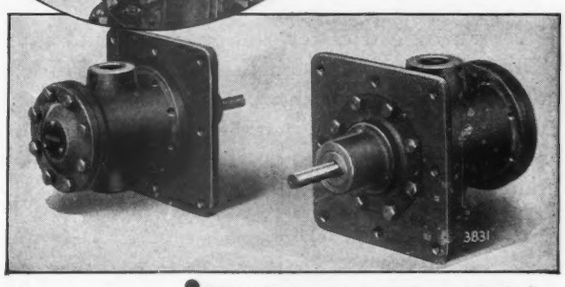
● Standard mounting, as used for motor or turbine drive.



● Integral mounting on the machine for which lubrication is supplied.

DE LAVAL-IMO PUMPS

are supplied for pumping oil in all capacities and for pressures up to 500 lb. per sq. in. and above. *Our engineering corps will prepare special designs for exceptional conditions.*



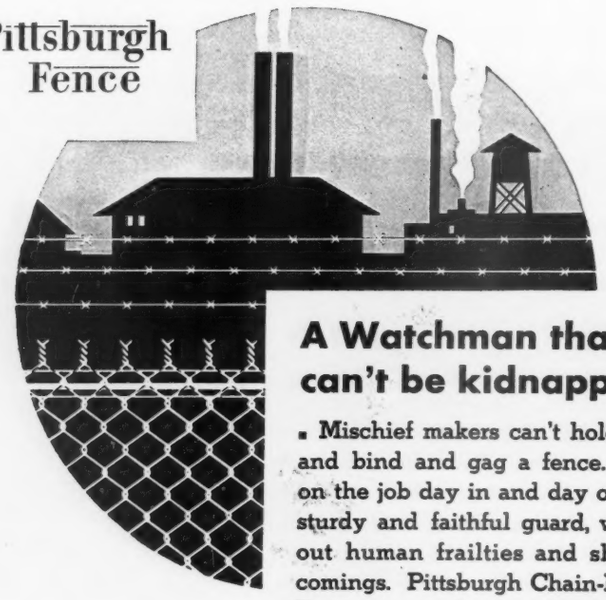
● Special flange mounting, as used for fuel and lubricating oil with Diesel engines.

De Laval *Steam Turbine Co.*, Trenton, N. J.

I-7

Manufacturers of Steam Turbines, Centrifugal Pumps, Propeller Pumps, Rotary Displacement Pumps, Centrifugal Blowers and Compressors, Worm Gears, Helical Speed Reducing Gears, Hydraulic Turbines, Flexible Couplings and Special Centrifugal Machinery. Sole Licensee of the Bauer-Wach Exhaust Turbine System.

Pittsburgh Fence



A Watchman that can't be kidnapped

▪ Mischief makers can't hold up and bind and gag a fence. It's on the job day in and day out, a sturdy and faithful guard, without human frailties and shortcomings. Pittsburgh Chain-Link Fence is made to give many years of trouble-free service. A "Pittsburgh" representative will be glad to estimate the cost of fencing your property without obligation on your part.

PITTSBURGH STEEL COMPANY Union Trust Bldg. PITTSBURGH

He's a Rugged Brute to take the Heavy Loads

Here's a rugged caster, designed to stand rough handling and like it. The sturdy, overload qualities of Bond Truck Casters are put there for the plant that needs them. Bond Casters are also built for quiet operation, easy wheeling, narrow turns or rough floors. Whatever your particular needs, there is a Bond Caster to exactly fit the purpose. Just put it up to the Bond distributor in your city, or write to us direct.

Bond REG. U.S. PAT. OFF. **TRUCK CASTERS** AND POWER TRANSMITTING MACHINERY

BOND FOUNDRY & MACHINE COMPANY
MANHEIM, LANC. CO., PENNA.
PHILA. OFFICE: 617 ARCH ST. N. Y. C. OFFICE: 30 CHURCH ST.

terials, studies are usually made to determine the long-time trend of costs, and a price is set that may not be changed for one or perhaps two years, unless there is an apparently permanent change in underlying conditions. The fixed standard price saves much competition, and becomes a convenient datum point for judging the extent and trend of variances.

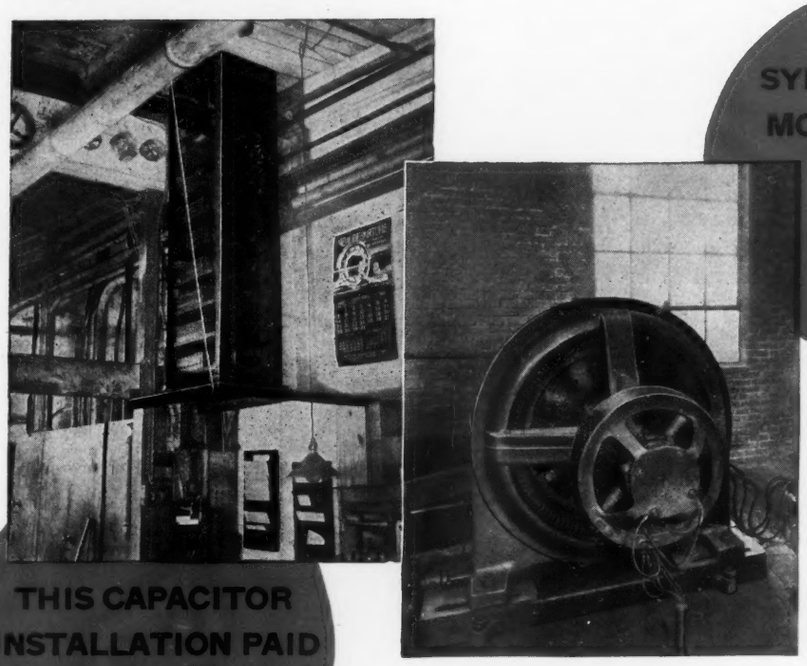
If all this work of standardization and control were undertaken merely to have a standard cost system, it would be an expensive luxury. Properly done, it is usually very profitable in itself, leading almost invariably to the discovery and correction of numerous faults and leakages. One accountant has said that he would install standard costs and budget control if for no other reason than to concentrate the attention of the organization on the possibility of such improvements.

On the face of it, what with the entry of both standard and actual costs, the clerical expenses of a standard cost system look high. Actual practice frequently proves the opposite; clerical costs may often be reduced. This is because only variances and totals need be dealt with. There is no longer need to post every individual time card or requisition to a job cost sheet. The cost sheet will be extended at standard cost, a simple clerical operation. Actual labor and material costs will be totaled for the process, job, or other classification, and compared with corresponding standard totals. Variances on individual time cards or requisitions, exceeding certain limits, may be held out for immediate investigation and for later accumulation to the proper variance account. One firm instructs the timekeepers to hold out for investigation jobs showing a variance of more than 20 per cent from standard labor time. An increased control is thus secured with a reduction in clerical work.

Too often the ordinary cost system does not make the information available until the order is shipped and it is too late to do anything. The standard cost system is in line with the tendency to use cost data preventively and currently rather than historically. As one speaker put it, it is control by the speedometer rather than by the mileage indicator.

HERE'S ADDED PROOF

THAT POWER-FACTOR IMPROVEMENT REDUCES POWER COSTS



THIS SYNCHRONOUS MOTOR SAVED $4,500—A 138% RETURN ON INVESTMENT

THIS CAPACITOR INSTALLATION PAID FOR ITSELF IN LESS THAN ONE YEAR

THE United Steel and Wire Company, of Battle Creek, Michigan, installed an 80-kv-a. G-E capacitor equipment early in 1933. The improved power-factor that resulted effected savings of $1,073 in power costs during the first twelve months of operation. This amount covered installation costs as well as equipment costs.

This installation, as illustrated above, shows how G-E capacitors can be readily located in even the most out-of-the-way places. Their quality of nonflammability and their smaller size and lighter weight permit their being located in many places where oil-filled capacitors could not be used.

THE Powhatan Mining Company, of Powhatan, Ohio, recently modernized an old ventilating-fan drive in its plant. The installation consisted of a G-E synchronous motor (200 hp., in this case) and control.

The cost of this equipment was $3,258. A recent check shows that the annual power savings amount to $4,500 — a return of approximately 138 per cent on the investment.

The record of this installation, like that of many others in our files, gives proof of the savings which are being made with G-E synchronous motors for power-factor improvement. They are savings which pay for the equipment quickly and then add to the profits.

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In hundreds of cases, the installation of G-E power-factor improvement equipment — capacitors, synchronous motors, synchronous condensers — has improved plant operation and effected savings. In those cases where power contracts included a penalty for low power-factor and a bonus for its improvement, substantial returns have been made on the investment. Look into these savings. Simply fill in and mail the attached coupon; or, if you prefer, call the G-E sales office nearest you.

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GENERAL ELECTRIC

Mechanical Clearances for Motor Coils

(Continued editorial page 565)

Supporting brackets for tie rings must be used when the coil overhang exceeds 8 inches or when the thickness of the ring material is $\frac{3}{4}$ inch or more. These supporting brackets or arms are fastened to the side of the core endplates and are made in a large variety of shapes and sizes; of late, they are being fabricated from angle iron by welding.

The main purpose is to provide a solid, substantial supporting structure for the coil end windings and the bracing mediums employed. Any good mechanic can develop suitable supports for a machine. In general, $1\frac{1}{2}$x$1\frac{1}{2}$x$\frac{1}{4}$- or 2x2x$\frac{1}{4}$-inch angle iron can be used for brackets. Slots are cut into the surface that is attached to the core end iron. These slots should be $\frac{1}{8}$ to $1\frac{5}{8}$ inches long, depending on the size of the bolt, to permit adjusting the arms up or down.

Figure 2, diagram *X*, shows the general shape of fabricated angle-iron, tie-ring-supporting brackets. The arm at the left is made by welding a piece of angle iron, *C*, to a flat piece of steel, *D*, which is bolted to the core endplate. Ring support details, *A* and *B*, are made from a piece of round stock, *A*, which has a vee cut in one end, into which the small piece of angle iron *B* is welded. Slots in the plate *D* permit adjusting the arm to make a tight fit against the ring.

Diagram *Y* shows another type of support arm. The angle, *G*, is made to suit the end winding and when the arm, *C*, is 9 inches or more in length a brace, *E*, is welded in place to strengthen the bracket.

The rings to which the coils are tied are made from steel and must be insulated in accordance with the data in Table II in the preceding article for insulating jumper and cross-connections. When the sections of the supporting bracket in contact with the tie rings are of metal these parts should have the same wall insulation, *T* in Figure 1, as the ring.

Spacing of brackets depends upon the type of winding, its overhang,

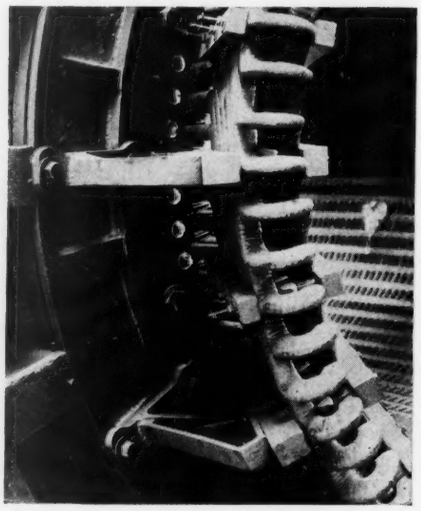
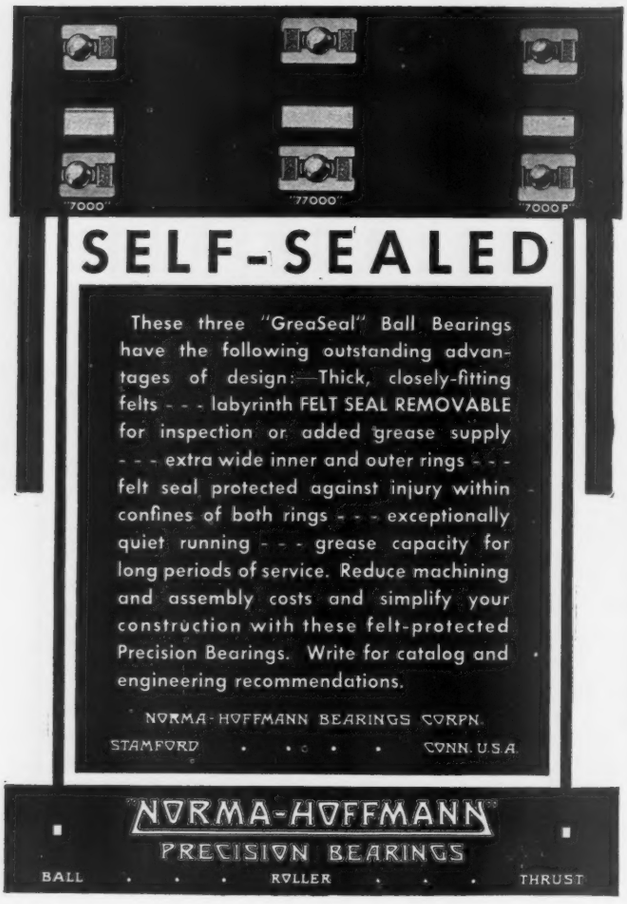


Figure 4. Method of bracing end windings of a turbo-generator

weight, angle, and so on, but in general, spacing on 18-inch centers is safe for large windings; 36-inch spacing can be used for light windings, employing one ring.

When the coils do not make a good fit on the ring, or when the ring does not fit the supporting brackets, the inside or outside diameters can be altered to suit as follows: Bind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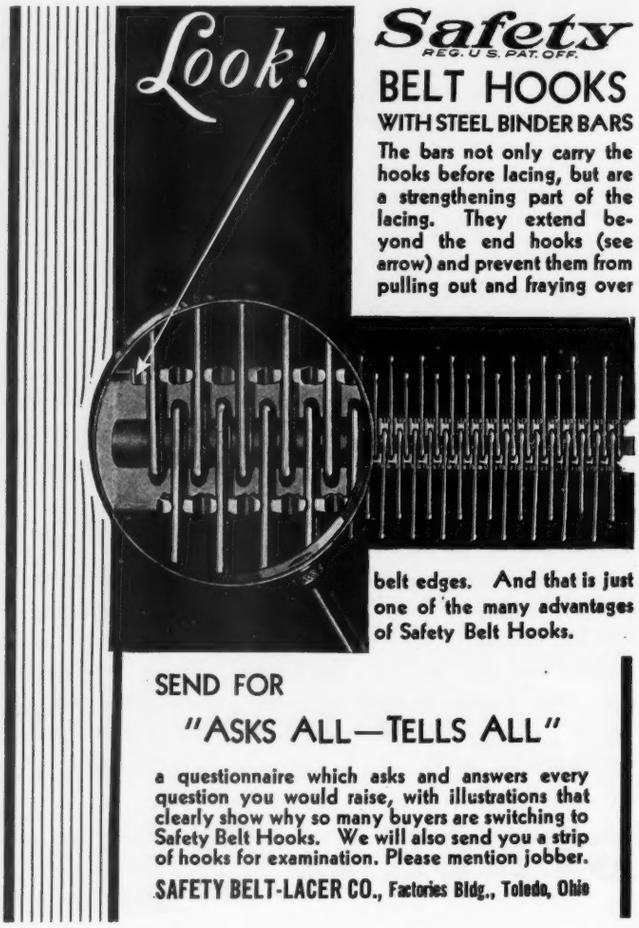
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strips of treated fullerboard on either the inside or outside diameter of the ring with 0.007-inch cotton tape until the rings meet the conditions. Rings should be altered in this way not to exceed a maximum of ½ or 1 inch on the diameter.

Methods of Bracing

Figure 3 shows a double row of rectangular tie rings used to brace the ends of a large, heavy winding. Note the supporting arms and the method of making and insulating the coil connections. When more than one tie ring is used it is customary to tie each coil as it is wound into the stator.

In Figure 4 is shown a method of bracing the end windings of a turbo-generator, using cast-iron supports to which are bolted hard wood (maple) blocks. A block is also placed between the layers of coil ends. A set of unsupported clamping blocks is placed between the supports. All through bolts are made of brass. They are insulated from the winding, but are all tied together with bare copper wire and grounded to the frame.

Figure 5. This end winding is well braced by two tie rings and two rows of tape bands applied directly behind each ring

A well-braced end winding is shown in Figure 5 where the coils are fastened to two tie rings. In addition, two rows of tape bands are used to fasten adjacent coil ends together. Note the location of the tape bands with reference to the tie rings. This arrangement insures maximum tightness, since each ring has its own supporting brackets, as shown.

A Helpful Formula

The following formula will help to indicate when a winding needs additional bracing or is sufficiently braced for full-voltage starting. It is based on the deflection due to the starting or locked amperes and the length of the coil end extension.

$D = 0.5 \times L^2 \times B^2 \times 10^{-10}$,

Where D = Deflection of winding.

L = Locked amperes per square inch of conductor (locked amperes divided by square inches per conductor).

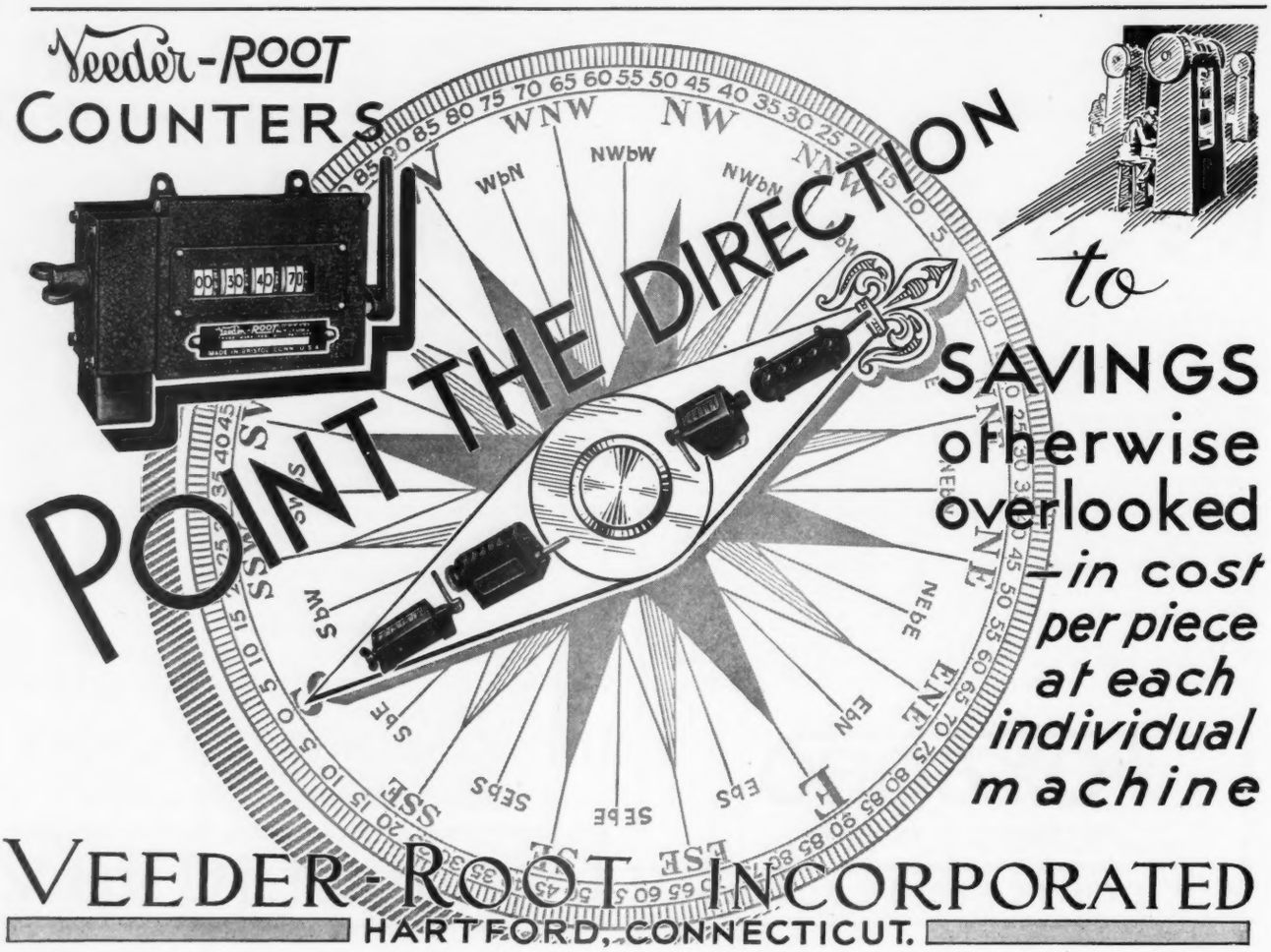
B = Length of bottom coil end.

Safe values for D are 0.03 to 0.06, but the lower values are preferable.

With one tie ring and one row of coil end bands, B can be reduced one-half.

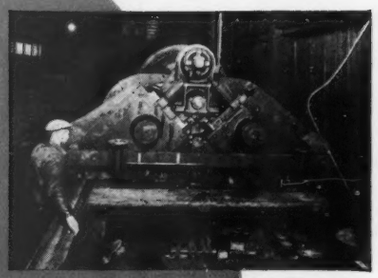
If there are two tie rings and two rows of spacers, B can be reduced to one-third of its value.

Thus, the addition of rings and tie bands reduces the effective length of B, which in turn reduces the value of D to a safe minimum.



FRICTION SAW

SAW CUTTING LARGE ROUND



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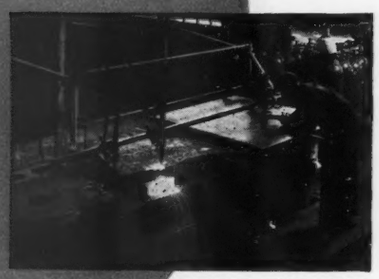

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What Price Correction?

(Continued from editorial page 562)

the corrective effect of the synchronous motors was not positively known.

The motor manufacturer put the losses at 26 kw. and the corrective effect at 170 kva. Metering revealed that the losses were 27.6 kw. and the corrective effect 150.4 kva. These figures do not include line or rheostat loss.

It was calculated that a capacitor of 300-kva. rating would bring the over-all power factor of the plant to 90 per cent lagging or higher during the time the plant was not operating, with a smaller percentage of increase during operating periods, and a resulting saving of about $275 a month. Savings have exceeded the estimate.

A reactive meter installed on the capacitor permits savings to be computed accurately. The table shows the various load conditions and calculated monthly savings for 1933 up to October; the capacitor was installed on the 12th of that month.

Trade Literature

(Continued from editorial page 568)

DOORS—Catalog A-75, on over-way doors. — Richards-Wilcox Mfg. Co., Aurora, Ill.

DUST COLLECTION — Bulletin 194, "Collecting Foundry Dust the Modern Way."—Whiting Corp., Harvey, Ill.

DUST FILTER—Bulletin S-76, shows and describes new Type EC Dust Filter.—The W. W. Sly Mfg. Co., 4700 Train Ave., Cleveland.

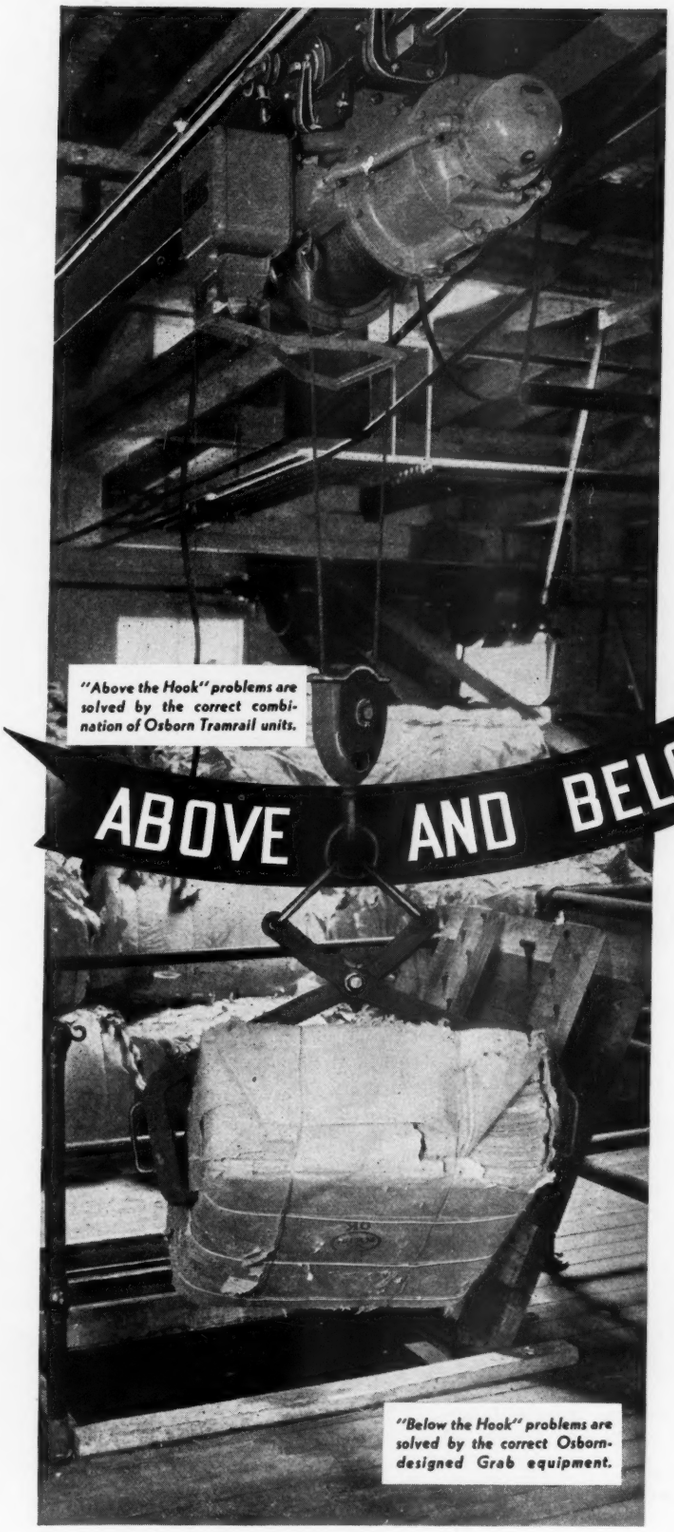
FANS—Bulletin, "To Keep Production Moving, Keep Air Moving with Propellair Fans." — Propellair, Inc., Springfield, Ohio.

IRON—Booklet, 64 pages, tells the step-by-step story of modern manufacture of sheet iron.—Republic Steel Corp., Massillon, Ohio.

IRON—Folder, "12 Steps to Enameling Iron Control."—American Rolling Mill Co., Middletown, Ohio.

LADLE—Bulletin No. 193, ". . . and Now, a Better Ladle by Whiting."—Whiting Corp., Harvey, Ill.

LIGHT—Light Direction Indicator,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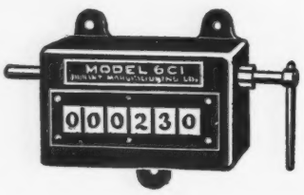

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for determining whether proper lighting exists at a given point.—Westinghouse Lamp Co., 30 Rockefeller Plaza, New York.

LUBRICATION — Pamphlet, issued jointly by The Meriam Co. and Socony-Vacuum Oil Co., contains operating instructions, oil and lubrication data for Meriam rebuilt gas engines and gas engines in general.—The Meriam Co., 1955 W. 112th St., Cleveland.

LUBRICATION—Technical Bulletin No. E220, "Concerning Graphoid Surfaces and the Parts They Play in Lubrication."—Acheson Colloids Corp., Port Huron, Mich.

MATERIAL — Bulletin on Norbine (Norton Boron Carbide) "The Hardest Material Ever Produced by Man for Commercial Use."—Norton Co., Worcester, Mass.

METERS—Bulletin No. 424, "Bristol's Metameter for Telemetering Pressure, Liquid Level, Temperature, Flow, and Motion."—The Briston Co., Waterbury, Conn.

PAINT SPRAYING EQUIPMENT—1934-35 Catalog covering equipment for spraying paint, oxy-acetylene apparatus, and portable carbide lights.—The Alexander Milburn Co., 1416 W. Baltimore St., Baltimore, Md.

PHOTOELECTRIC CELLS—Folder PC-2, illustrates and describes Cetron photoelectric cells.—Continental Electric Co., Saint Charles, Ill.

PYROMETERS—Leaflet A-3410, describing a line of small single and multiple pyrometers.—Thwing Instrument Co., 3339 Lancaster Ave., Philadelphia.

PUMP—Bulletin 5550, illustrates, describes a built-together motor and pump unit.—Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago.

RELAYS—Circular B-1-A, on sensitive, toggle, polarized, power, and time delay relays.—Weston Electrical Instrument Corp., Newark, N. J.

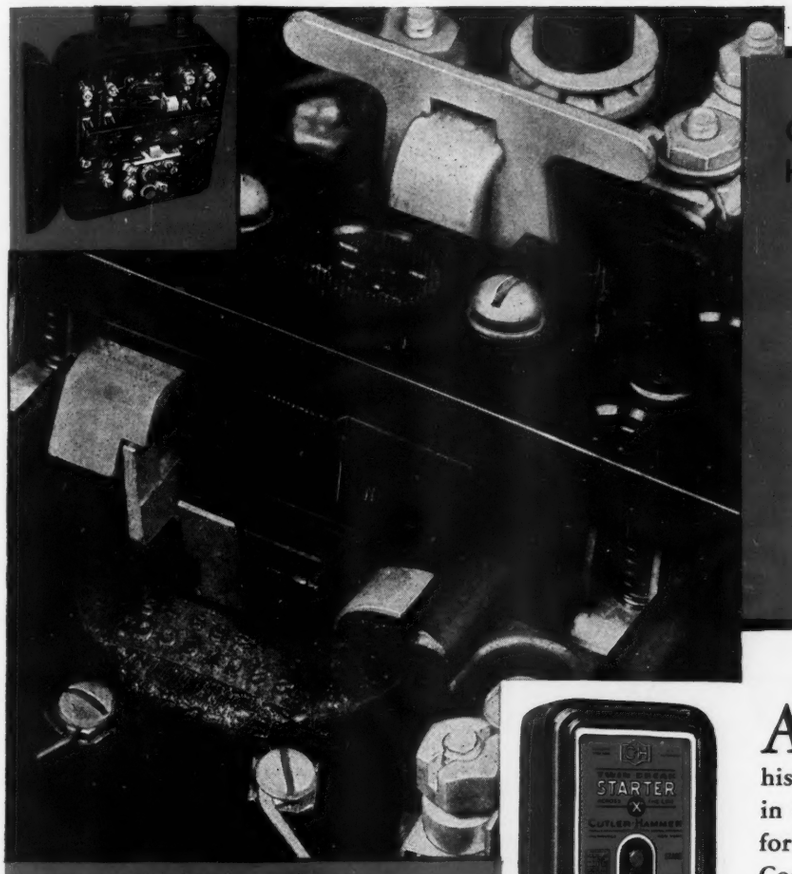
RESINS—Booklet, on Neville synthetic resins, their types and uses. — The Neville Co., Pittsburgh.

STEEL—Series of tables, "Multiples at a Glance," for those who use steel in multiple lengths.—Timken Steel & Tube Co., Canton, Ohio.

STEELS — Catalog, "Corrosion and Heat Resisting Steels."—Crucible Steel Co. of America, 405 Lexington Ave., New York.

TESTING EQUIPMENT—Bulletin 934, information on insulation, dielectric strength, resistivity, dielectric constant, power factor, and instruments for measuring them.—Sound Engineering Corp., 412 N. Leavitt St., Chicago.

TORCHES, MELTING KETTLE — Two leaflets, No. 189 on Aeroil "smokeless" melting kettles, and No. 183 on Aeroil fire gun No. 99; also Bulletin No. 102 on Aeroil thawing outfits and torches. —Aeroil Burner Co., Inc., Park Ave. at 13th St., West New York, N. J.



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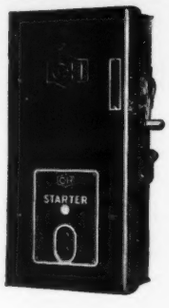

C-H 9586 "AAA" Starters are available in all needed types, explosion-proof, dust-tight, oil-immersed, combination starter and disconnect switch, reversing starters in horizontal, vertical or back-to-back construction, etc. The C-H line is complete. The combination starter and disconnect switch is illustrated.

CUTLER HAMMER

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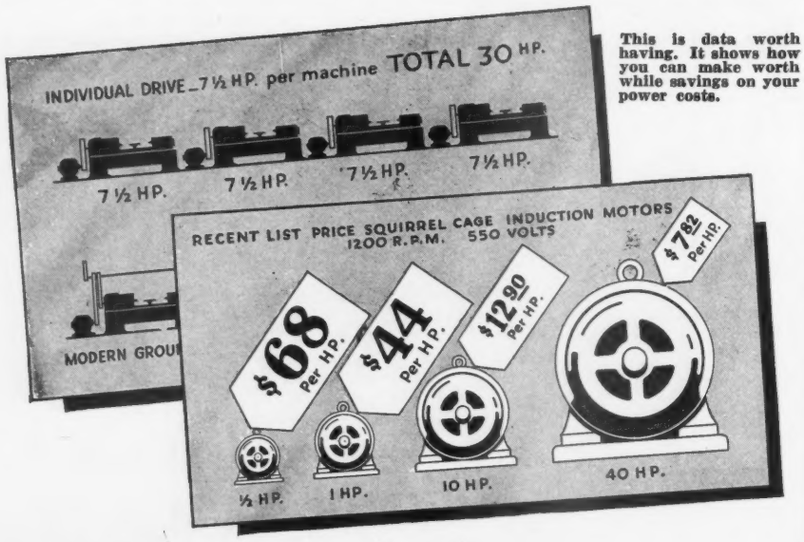
(B-254)



This is data worth having. It shows how you can make worth while savings on your power costs.

JUST A! REMINDER

that you send for your copy of the Red Book of Industrial Power Transmission as offered by the Power Transmission Council

ON PAGES 12 and 13

of this issue of Factory Management . . . If you prefer, you can write *us* and *we* will send you a copy together with an interesting and valuable Case Study of Power Transmission Costs for your type plant. The latter is one of a number of actual case studies by power transmission engineers showing detailed costs of operating modernized group drives compared with cost of unit drive on each machine. Send for them *now*, to . . . . . .

A group of 12" Schieren belts in regular service for 31 years, and good for many more. This is typical of the Service you get from Schieren-ized Belting.

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Books

BEYOND THE NEW DEAL

David Lawrence, Editor, The United States News. Whittlesey House, McGraw-Hill Book Co., Inc., 330 West 42d St., New York. 317 pages. $2.50.

The viewpoint of a conservative analyzing the New Deal and its implications to government and individuals. He gives credit where credit is due, but isn't satisfied with prospects.

THE "PAY-AS-YOU-PRODUCE" WAGE PLAN

Allen W. Rucker, President, The Eddy-Rucker-Nickels Co. The Eddy-Rucker-Nickels Co., Harvard Square, Cambridge, Mass. 28 pages. $1.

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INDUSTRY'S OPPORTUNITY TO PROMOTE RECOVERY

Allen W. Rucker and N. W. Pickering, President, Farrel-Birmingham Company, Inc. Farrel-Birmingham Co., Inc., Ansonia, Conn.

No. 9 in a series of booklet-editorials aiming to show that fundamental laws of economics will eventually assert themselves.

On the Calendar

DECEMBER

3-8, Eleventh National Exposition of Power and Mechanical Engineering, New York. Charles F. Roth, International Exposition Co., Manager, Grand Central Palace, New York.

3-8, American Society of Mechanical Engineers, 56th annual meeting, New York. C. E. Davies, Executive Secretary, 29 W. 39th St., New York.

5-6, National Association of Manufacturers, annual meeting, New York. Walter B. Weisenburger, executive vice-president, 11 W. 42d St., New York.

6-7, Federated Management Societies, first annual conference, New York. Member societies, Taylor Society and the Society of Industrial Engineers, cooperating with Management Section of American Society of Mechanical Engineers and Stevens Institute of Technology. W. H. Leffingwell, president, The Taylor Society, 29 W. 39th St., New York.

27-Jan. 2, American Association for the Advancement of Science, annual meeting, Pittsburgh. Henry B. Ward, permanent secretary, Smithsonian Institute Building, Washington, D. C.

JANUARY

10-12, American Engineering Council, annual meeting, Washington, D. C. Frederick M. Feiker, executive secretary, 744 Jackson Place. N.W., Washington, D. C.

14-18, Society of Automotive Engineers, annual meeting, Detroit. John A. C. Warner, 29 W. 39th St., New York.

22-25, American Institute of Electrical Engineers, winter convention, New York. H. H. Henline, National secretary, 29 W. 39th St., New York.

28-30, American Society of Heating and Ventilating Engineers, annual meeting, Buffalo. A. V. Hutchinson, secretary, 51 Madison Ave., New York.

MARCH

5-8, Fifth Packaging Exposition, Palmer House, Chicago. Sponsored by American Management Association. Alvin E. Dodd, executive vice-president, 20 Vesey St., New York.

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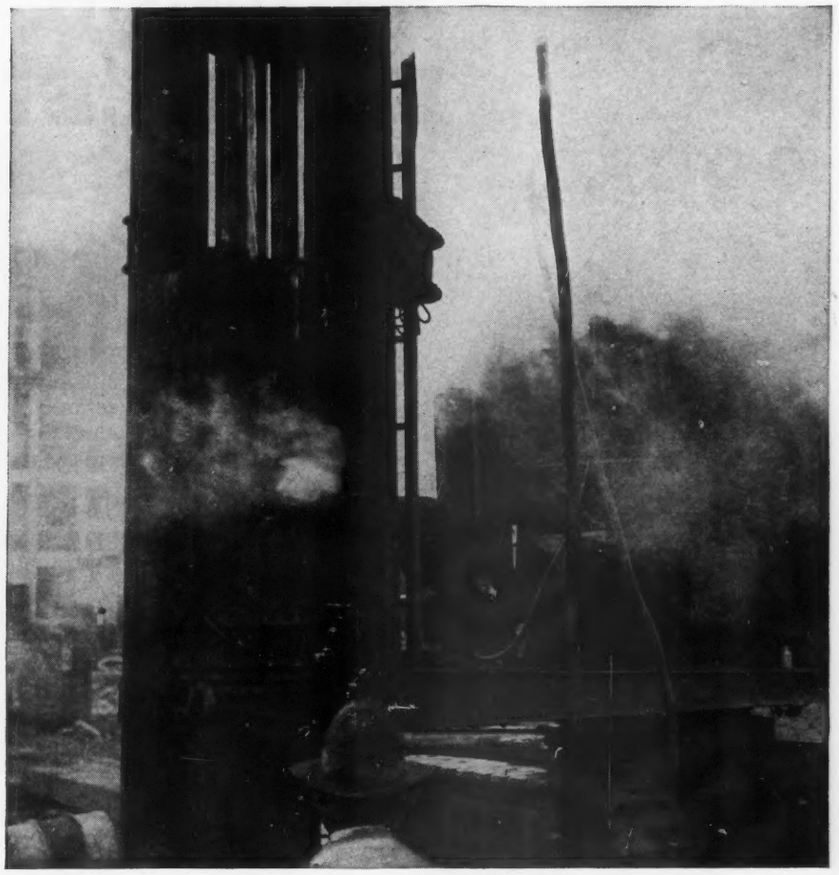

FULL STEAM AHEAD—Quick-time repair by bronze-welding fractured steam hammer cylinder saves money—cuts delay on job.

IT looked as if nothing could prevent the expenditure to replace the fractured steam hammer cylinder on the foundation company's pile driver.

A Linde Service Operator was called and, on examining the cylinder, found that it could be made as good as new by bronze-welding. With his cooperation the work was rapidly completed. The cost of materials and labor amounted to about $31—a saving of $354 over the cost of $385 for a new cylinder. Tests proved that the bronze-welded repair was fully capable of withstanding the severe service of everyday operation. The foundation company was highly pleased with the result.

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Fingers become geared to the Knurled head so they can't slip, which makes the Knurled "Unbrako" a real time and labor saver

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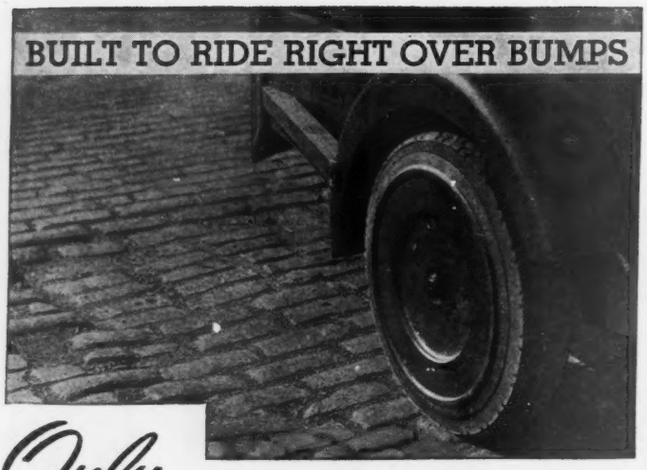
This is a sample of COLORGRAPH STEEL STRAPPING which can be furnished in any design and almost any color combination



Only "BANTY" has full spring suspension

Semi-elliptic springs front and rear, plus zero pressure tires on the drive wheels make "Banty" an easy-riding industrial tractor. Springs prevent excessive driver fatigue, protect the entire tractor mechanism against wear and tear, cut maintenance and repair expense.

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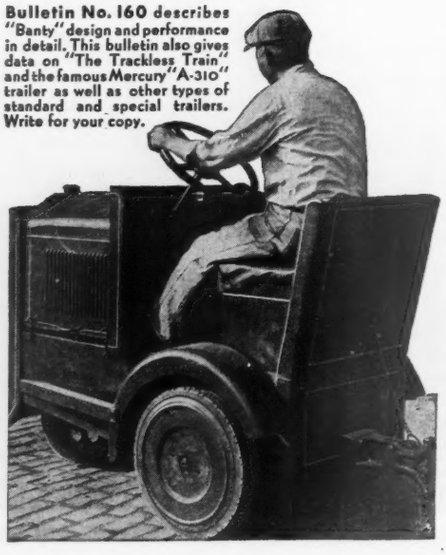
Bulletin No. 160 describes "Banty" design and performance in detail. This bulletin also gives data on "The Trackless Train" and the famous Mercury "A-310" trailer as well as other types of standard and special trailers. Write for your copy.



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WHY NOT TRY THEM HERE
WELL - HOW DO YOU LIKE THE NEW ONLIWON TOWELS?
SWELL, THEY'RE MAN-SIZED - SOFT AND STRONG TOO
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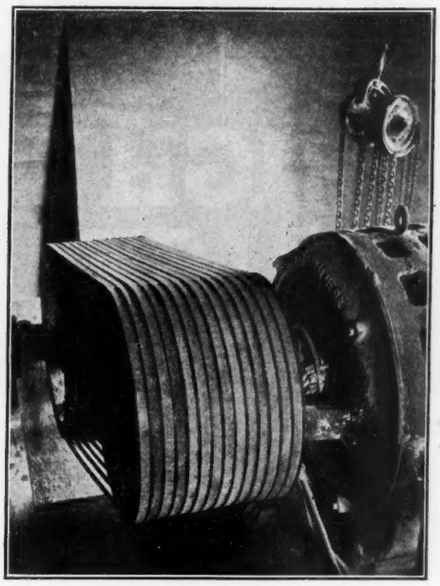
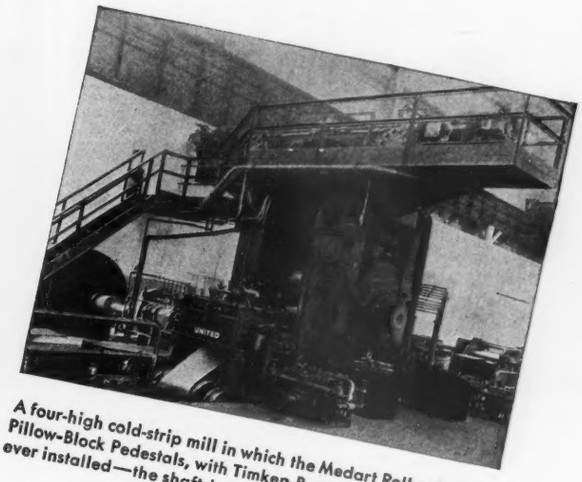


This is a typical installation where Medart is reducing power transmission costs. Medart V-Belt and other installations are doing this throughout industry.



A four-high cold-strip mill in which the Medart Roller-Bearing Pillow-Block Pedestals, with Timken Bearings, are the largest ever installed—the shaft being approximately 12" diameter.

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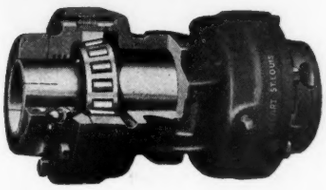
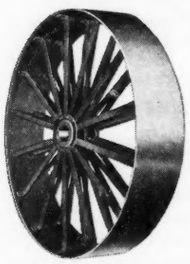


Medart-Timken Ball and Socket Hanger Bearing



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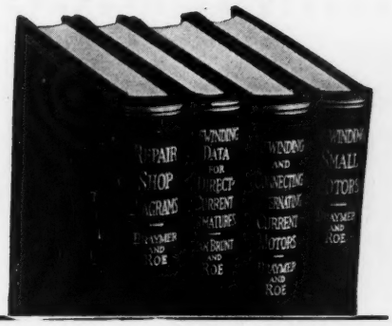

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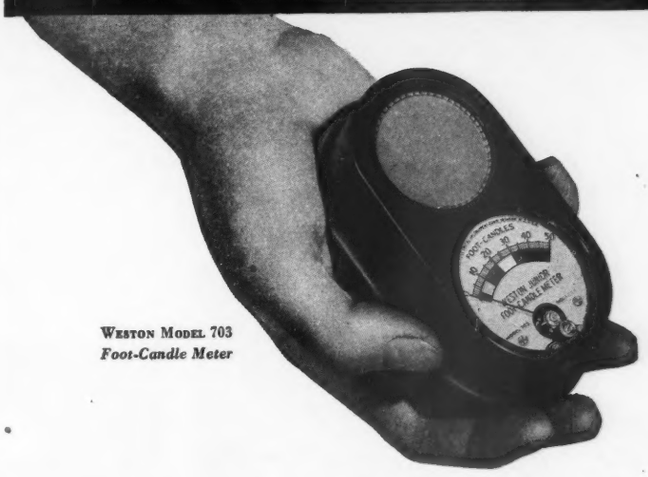

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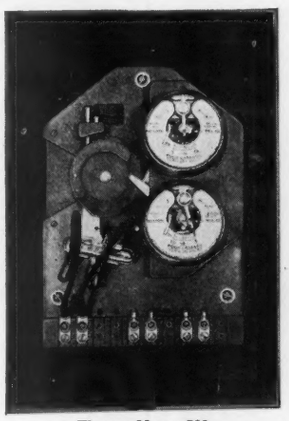

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New York, Brooklyn, Newark, N. J., Boston, Philadelphia, Cleveland, Cincinnati, Detroit, Chicago, Minneapolis, Milwaukee, St. Louis, Dallas, Kansas City, Los Angeles, San Francisco, Seattle. Export Office: Toledo, Ohio.

BUNTING

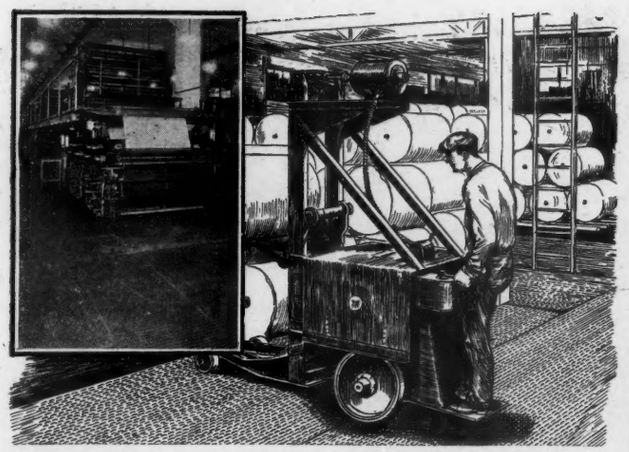
QUALITY
BUSHINGS · BEARINGS · BARS · PARTS
ANTI-FRICTION METAL

REDUCING INDUSTRIAL OVERHEAD

UTILITY

MINNEAPOLIS-HONEYWELL automatic controls reduce overhead and solve a multitude of industrial problems. Economies range as high as 35 percent and result not only from fuel savings in heating and processing, but in greater efficiency from employees working under healthful conditions. Directly applied to processes, automatic controls reduce spoilage, lower supervision costs and increase the quality and uniformity of your product. The Minneapolis-Honeywell engineer in or near your city will gladly show you how an automatic control system will reduce your overhead, in either large or small installations and in old or new equipment or plants. Minneapolis-Honeywell Regulator Co., 2706 Fourth Ave. So., Minneapolis, Minn. Branch or distributing offices in all principal cities.

MINNEAPOLIS HONEYWELL CONTROL SYSTEMS



NEW FLOORS OVER OLD!

No matter how badly your floors are worn—or what kind of floors they are—you can repair them, quickly, in a few hours if need be, at reasonable cost. You can lay a new, safe, durable floor over the old—one that will do away with all maintenance cost for years to come.

"A.W." ROLLED STEEL FLOOR PLATE

is safe, sanitary, durable. Made in tread patterns and weights for all industrial requirements. Costs no more to install than other good flooring. Saves most where conditions are worst. For recommendations and estimates write us or any of our representatives.

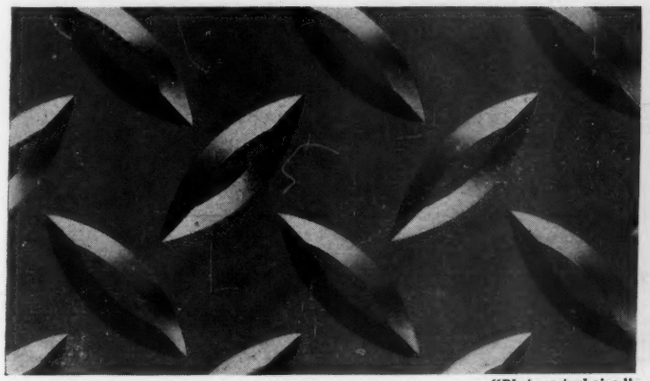
ALAN WOOD STEEL CO.

CONSHOHOCKEN, PA.

108 Years Iron and Steel Making Experience

BRANCHES: Philadelphia, Pa., Fidelity Philadelphia Trust Bldg.; New York, N. Y., 60 E. 42nd St.; Boston, 250 Stuart St.; Los Angeles, 620 W. McGarland Bldg.; San Francisco, 444 Market St.; Seattle, 4535 5th Ave., N.E.

REPRESENTATIVES: Buffalo, F. E. Allen, Inc.; Pittsburgh, C. C. Poling Co.; Detroit, G. C. Davies Co.; Cleveland, J. F. Corlett & Co.; Chicago, A. M. Castle & Co.; New Orleans, Jones & Laughlin Steel Corp.; Birmingham, J. H. Scruggs Co.; Minneapolis, R. E. Deutsche Co.; Memphis, S. A. Hunt, P. O. Box 1646.



"Photo, actual size."

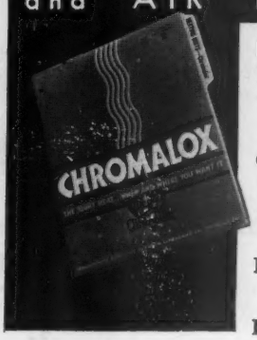
Type HF Chromalox-equipped Unit Heater, for 115 or 230 volts, 60 cycles A. C., 6 sizes, 1.5 k.w. to 4.5 k.w. complete with automatic temperature control.

Type UAB Chromalox-equipped Unit Heater, efficient, trouble-proof, durable. Provides perfect heat circulation—no cold spots. Built in capacities from 5 k.w. (17060 BTU) to 40 k.w. (136480 BTU).

Here's HEATING COMFORT and ECONOMY . . . for your plant

- *Electric heat,* as applied with these Chromalox-equipped Unit Heaters, gets going almost instantly with the throw of a switch—no lag, no waiting.
- *It is easily directed* to heat a single spot, or to set up blower-induced warm air circulation through an entire room—far more efficient than other heating methods.
- *It is easily installed*—as quickly and conveniently as running a wire line—you can always place a Chromalox-equipped Unit Heater at exactly the right spot to do the most good.
- If your problem includes heating an isolated building, room or floor—keeping temperatures up during off-peak periods, when fires are banked—stepping up temperature in a faulty air duct—or any application of heat to process work, meet the need with

CHROMALOX ELECTRIC UNIT HEATERS and AIR DUCT HEATERS



Mail With Your Business Letterhead
EDWIN L. WIEGAND CO.,
7518 Thomas Blvd., Pittsburgh, Pa.

Send me the new 60-page CHROMALOX book. I wish to heat

.....

Name .....

Position .....

"What's New"

BY THE EDITORS

"KEEP ALERT"

. . . KEEP UP WITH

Problems you face today cannot be solved with the methods of yesterday. Tomorrow may bring still other problems. The new competition is not only between products, it's between men.

The man who wants to lead, the man who is fighting for his business or his job, must know what is going on. Must know what's latest and best in methods, materials, machines. Must know the meaning of new rules, new laws, new Codes.

Your business paper is edited to help you in your job. To bring you the news of your industry. To *interpret* this news in terms of its effect on production costs, labor conditions, markets, competition and the other primary factors of business and industry. Your business paper has been giving special attention to the modernization of plant and equipment.

McGRAW-HILL PUBLISHING COMPANY, Inc.

"Where to buy it"

BY THE ADVERTISERS

CHANGING CONDITIONS

It is a timely, important publishing job because every industry is struggling with the problem of producing reduced volume at lower unit costs.

Can you afford to be without the help your business paper's editors are offering you? Can you afford to miss the information that manufacturers are laying before you in the advertising pages? On your reading habits depend largely your chances for success. Keep up! *Keep alert!*

Examine the list of McGraw-Hill Publications at the right of this page. A coupon is provided for your convenience in sending your subscription. Or we will be glad to send sample copies of any of these papers, free of charge, and without obligation to buy. Check the items in which you are interested, and return the coupon today.

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Electrical Merchandising . . . serves the electrical appliance trade . . . electrical retailers and wholesalers . . . helps them become better merchants.

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Electronics . . .design, engineering and manufacture of radio, sound, and communication devices. Features new uses of electronic tubes.

Engineering and Mining Journal . . . complete and authoritative technical and market publication of mining, milling, smelting and metal refining industries.

Engineering News-Record . . . leading weekly publication of civil engineering and construction, covering news and technical performance.

Factory Management and Maintenance . . . all phases of plant operation . . . management, production and services including maintenance of electrical and mechanical equipment.

Food Industries . . . production, operation, engineering, and distribution in food manufacturing and processing plants of all kinds.

Metal and Mineral Markets . . . weekly news of metal and non-metallic markets and prices from original sources . . . for consumer and producer.

Power . . . every phase in the production and transmission of power in any form, including all prime movers, and auxiliary equipment.

Product Engineering . . . for engineers and executives who create, design, and develop machinery and "engineered" metal products.

Radio Retailing . . . home entertainment merchandising . . . for retailers and wholesalers of radios and allied products, and their service men.

Textile World . . .business and technical, edited generally for the textile industries, and specifically for cotton, wool, silk, rayon, knit goods, and processing.

Transit Journal . . . engineering and business magazine of local transportation, electric cars, rapid transit, buses, trolley buses, and taxicabs.

Mail the Coupon TODAY!

McGRAW-HILL PUBLISHING COMPANY, INC.
330 West 42nd Street, New York, N. Y.

Please enter my subscription to the following publications and bill me with the first issue

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or please send me, without obligation, the material checked below.

☐ Sample copies of the following publications

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☐ Descriptive folder of all McGraw-Hill Publications

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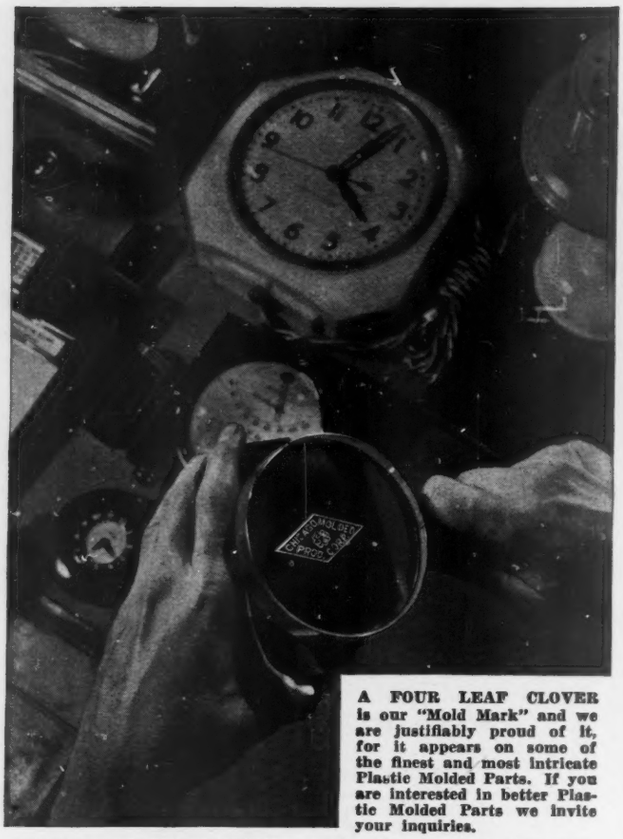
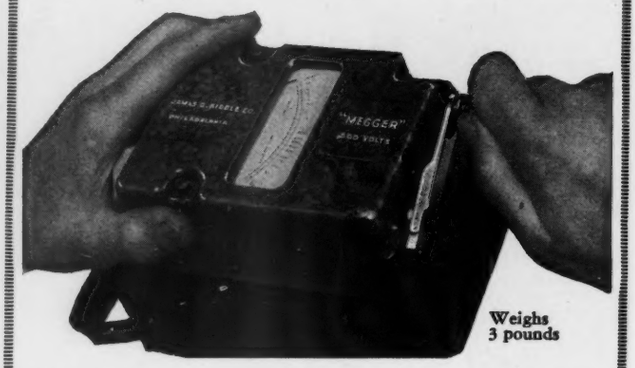


A FOUR LEAF CLOVER is our "Mold Mark" and we are justifiably proud of it, for it appears on some of the finest and most intricate Plastic Molded Parts. If you are interested in better Plastic Molded Parts we invite your inquiries.

CHICAGO MOLDED PRODUCTS CORP.
2148 Walnut St. Chicago, Ill.

FOR THOSE INCIPIENT TROUBLES
THAT ONLY THE "MEGGER" WILL DETECT



Weighs 3 pounds

The NEW MIDGET "MEGGER" TESTER

Range—0 to 20 Megohms, Generates 500 Volts

NO longer do you need to *borrow* a "Megger"—after trouble has occurred. It will *cost you less* to own and use frequently this new, small, reliable but inexpensive "Megger" Tester. Don't wait for *insulation failure* and consequent shut-down—that *is* expensive; get a "Megger" *now*, test your motors, wires, cables, etc., forestall failure, prevent shut-down and *plan* your electrical maintenance!

Write for Bulletin 1365-F.

JAMES G. BIDDLE CO.
ELECTRICAL INSTRUMENTS
1211-13 ARCH STREET PHILADELPHIA, PA.

• LIQUIDATION SALE

of GRIGSBY-GRUNOW CO., Inc.

makers of *Majestic* Radios, Tubes, Refrigerators

by order of the UNITED STATES DISTRICT COURT

PURSUANT to an order of the United States District Court all of the machinery, equipment and inventory of Grigsby-Grunow Company is now being sold by the Trustee. An immediate inspection of the property is urged as sales are being made daily to many of the large concerns throughout the country.

The good will, patents, trade marks, trade names and the real estate are also being offered for sale.

The machinery consists of the very finest makes of all types of metal and wood working machinery, also a completely equipped tube, enameling and plating plant, all of which are in immediate operating condition.

The inventory consists of made-up parts, parts in process and raw materials for radios, refrigerators and radio tubes. The Service Department on all three items has been kept intact.

The GOOD WILL consists of the name "MAJESTIC" as applied to radios, refrigerators and tubes, which name has been extensively advertised throughout the world, and which is secured by copyrights in practically every country in the world including many other trade names, patents and copyrights.

The real estate consists of factory buildings having a floor area of approximately 950,000 square feet, suitable for any type of manufacturing.

The Trustee will receive offers for any part or parcels of the assets. All machinery and materials of production are reasonably priced. Competent salesmen will be glad to assist buyers at the plant, 5801 Dickens Avenue, Chicago, Ill.

REFRIGERATION SERVICE DEPARTMENT

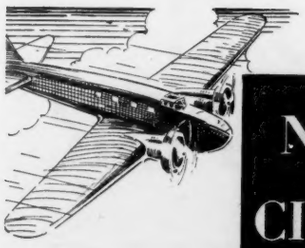
The Trustee, under order of the Court, has set up a Refrigeration Service Department, to maintain service and to sell service parts. This will maintain the name and prestige of "Majestic" and be an asset of major importance to anyone buying the "good will" of the company.

SERVICE PARTS FOR RADIOS

There is on hand a considerable quantity of service parts for radios which are staple merchandise and are being sold to the users of millions of Majestic radios now in service.

SEND FOR THIS CATALOG

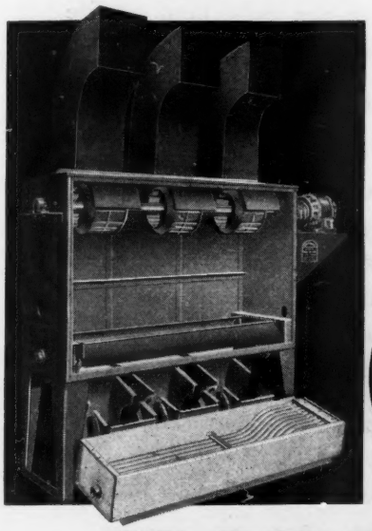
Lists all of the assets. Free to prospective buyers. Mail request to Frank M. McKey, Trustee in Bankruptcy, Grigsby-Grunow Co., Inc., 5801 Dickens Ave., Chicago, Ill.



You Can Profit from this Patented Feature

NON-STOP CIRCULATION of WARM AIR

- A unit heater is many times more efficient than direct radiation simply because its fans in operation circulate the heat produced. But when the ordinary unit heater has brought the room temperature up to the desired point, the thermostat stops the fans.
- When the fans stop, stratification starts. Cold air drops to the floor. Warm air rises to the ceiling. Fuel is wasted — plenty of it — an expensive method!
- But in factory heating THERE IS a better way to regulate temperatures! It is Clarage Syncrotherm Control—not only better, but far cheaper.
- With Syncrotherm Control, the fans operate ALL THE TIME during working hours. You get a CONTINUOUS, NON-STOP circulation of warm air.
- To maintain desired temperatures, instead of stopping and starting the fans, we regulate the amount of air passing through and around the heating coil. The advantages and economies of Syncrotherm Control are amazing, and it's offered on Clarage Unit Heaters AT NO EXTRA COST.



- Clarage Units are built in practical sizes for every industrial need. Coil removable and all parts accessible as shown. Write for Bulletin 103. CLARAGE FAN COMPANY, Kalamazoo, Michigan.

Syncrotherm Control IS STANDARD ON

CLARAGE

UNITHERM
UNIT HEATERS

An INTOLERABLE Situation!

● Few executives realize that stub-pencil records are behind many of the facts on which they base important decisions.

We refer specifically, to basic weight-records. These records are the foundation of every cost-control system where the weight of materials influences inventory records, quality-control, manufacturing operations and invoices to customers.

Human errors are a notorious menace to all Accounting Accuracy. They are even more dangerous in the original recording of the **basic facts,** from which accounting figures are derived. That is the Birthplace of Losses!

A Permanent Solution—The Toledo Printweigh forever eliminates errors in weight-recording. It certifies the accuracy of your weight-records by delivering a legible machine-printed record of each load placed on the scale. It prints on tickets, forms, or strip-tapes. It delivers from one to four records at a time, with equal speed and accuracy.

A Practical Suggestion—We urge that you investigate Printweigh's many profit-protecting features. Write for a copy of "Progress in Industrial Weighing"—a condensed fact-summary of printed weight-recording.

Better still, see **"On Guard"**—a 20-minute Toledovision talking picture, which presents Printweigh quickly, concisely, authoritatively. Simply instruct your telephone operator, "Phone the nearest Toledo Scale Company office to send over On Guard." A Toledovision operator will handle all details. The presentation will be made at your convenience, in your own office. No obligation, of course.

Eliminate this Birthplace of Losses, forever. Get these new facts on the printed weight-records furnished by the Toledo Printweigh.

TOLEDO SCALE COMPANY
TOLEDO • OHIO
NO SPRINGS • HONEST WEIGHT
181 SALES AND SERVICE OFFICES THROUGHOUT U. S. AND CANADA

★ ★

STRAIGHT FACTS FOR STRAIGHT THINKING

By *Newton D. Baker*

NEWTON D. BAKER, *CHAIRMAN*
NATIONAL CITIZENS COMMITTEE

1. It is true that billions are being spent by the Government in order that people may not die of cold and hunger.
2. But these billions, divided among the families in need, average for each family only about $24 a month.
3. And 70% of the free hospital services in the United States for the needy sick are provided by voluntarily supported hospitals. The sick among the unemployed number 48% more than among the employed.
4. Likewise public health nurses, also supported by your voluntary gifts, report that 66% of all their visits in 1933 were in homes unable to pay for the service rendered.
5. 30% more children have had to be removed from their own homes and cared for by voluntarily supported children's agencies.
6. Two-thirds of all the arrests for crime involve persons between the ages of 15 and 24 years. Millions of boys and girls living under conditions destructive to character need the character-building services of your recreation agencies.
7. A man may die of despair, as well as of hunger, for suicides, numbering 15,368 in 1928, grew to 20,927 in 1932. This shows that more and more people are ceasing to value the only kind of life they are able to attain.
8. America cannot be rebuilt by relief measures alone.
9. Your local community chest needs your support during this year of rebuilding human hope and morale. It supports hospitals, clinics, child-care organizations, character-building agencies and many other social services.
10. When you give in your city, you strengthen the forces of civilization in the neighborhood in which you live.

1934 MOBILIZATION FOR HUMAN NEEDS

FACTORY MANAGEMENT AND MAINTENANCE

Equipment—Material—Supplies — *SERVICE SECTION* — *For Plant—Mill—Factory*

KIRKLAND
BULLS-I-UNIT
Single Hole Mounting
For all pilot light purposes and for special annunciator construction.
Also special signal lamps, resistors, etc.
Write now for new bulletin No. 9134
MFGD. BY H. R. KIRKLAND CO.
75 West St., New York

"If I had only known about this product before—"

You may save yourself needless regret — and MONEY — by checking this page regularly *every issue.*

Had you noted that, in preceding issues, this page featured advertisements of

Welders
Heaters
Ladder Shoes
Tachometers
Electric Heat
Silent Gears
Package Edges
Non-Slipping compound
Belt Fasteners

To be informed—and reminded—of these further aids to efficient and economical plant operations we suggest that you check this section regularly.

For information write
Departmental Advertising Staff
FACTORY MANAGEMENT and MAINTENANCE
330 West 42d St., New York City

PULMOSAN RESPIRATORS
for **EVERY NEED**
Protection against
DUST
SPRAY MISTS
SANDBLASTING
WRITE for DETAILS
PULMOSAN SAFETY EQUIPMENT CORP.
176 Johnson St. Brooklyn, N. Y.

Run a 30-Day TEST *before you buy*

SpeedWay Oilers
End motor troubles
Take drag from shafting
Stop loose pulley squeaks

SpeedWay Oilers automatically maintain proper oil level on motors—end 75% of motor troubles, save oil, stop oil dripping, cut oiling time to a fraction. Thermal Oilers for shafting and straight bearings. Centrifugal Oilers for loose pulleys. Sent on 30-day approval.

Circular FREE — **SpeedWay Mfg. Co.** 1832 So. 52nd St., Cicero, Ill.

Hydro-Proof
for Repairing or Resurfacing Industrial Floors
The Asphalt Products Co., Inc.
Syracuse, N. Y.

SPECIFY
SYNTHANE
SILENT GEAR MATERIAL
(Laminated Bakelite)
SYNTHANE
CORPORATION OAKS · PENNA
Offices in Principal Cities

For Leather, Rubber and Fabric Belts
STEELGRIP
Flexible Belt Lacing

20% Stronger — Break to size, clamp on with hammer. Compresses ends, prevents fraying, adds to life of belt. Standard for conveyor belts and power drives in leading plants.

Write for Circular
Armstrong-Bray & Co.
313 N. Sheldon St.
CHICAGO, U.S.A.

ELECTRIC VALVES for AUTOMATIC CONTROL

Write for complete data on ELECTRICALLY OPERATED VALVES for automatic control of air, water, gas, oil, ammonia, etc.

May be operated by thermostat, time switch, float switch, etc. Available for A.C. or D.C. operation from ordinary lighting circuit.

ELECTRIC VALVE MFG. CO., Inc.
66 Murray St., New York, N.Y.

Do You Use Your Own Product?

If so, how many plants represented by the other 23,000 readers of Factory Management and Maintenance could use it too (and would BUY it) if your advertisement appeared here?

?

Find what you are looking for? If this or other advertising in this issue does not supply the information wanted of products or services, write

? ?

FACTORY MANAGEMENT and MAINTENANCE
330 W. 42d St., New York, N. Y.

?

SEARCHLIGHT SECTION

EMPLOYMENT : BUSINESS : OPPORTUNITIES : EQUIPMENT—USED or RESALE

UNDISPLAYED—RATE PER WORD:

Positions Wanted (full or part-time salaried employment only), 10 cents a word, minimum $2.00 an insertion, payable in advance. *(See ¶ on Box Numbers)*

Positions Vacant, and all other classifications, 15 cents a word, minimum $3.00 an insertion.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 inch.....$8.00
2 to 3 inches..... 7.80 an inch
4 to 7 inches..... 7.60 an inch
Additional Rates upon request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page. F.M.&M.

Copy for new advertisements accepted until the 20th for issue out 1st of following month.

EMPLOYMENT SERVICE

SALARIED POSITIONS, $2,500 to $25,000. This thoroughly organized advertising service of 25 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If you have actually earned over $2,500, send only name and address for details. R. W. Bixby, Inc., 276 Delward Bldg., Buffalo, N. Y. (F. M. M.)

POSITIONS WANTED

ELECTRICAL maintenance man or power plant assistant. Seven years' excellent experience here and abroad. Now employed. PW-240, Factory Management and Maintenance, 330 West 42d St., New York City.

FACTORY MANAGER—Superintendent. Long years of experience in the manufacture of pressed and deep drawn metal stampings of varied lines from non-ferrous alloys; steel; and stainless steels. Familiar tooling-up; development new lines of work; modern production methods; cost analysis and reduction. Now employed factory manager. PW-238, Factory Management & Maintenance, 330 West 42d Street, New York City.

WANTED POSITION by maintenance engineer 25 years' experience. Best of references available at once. PW-242, Factory Management & Maintenance, 330 West 42d Street, New York City.

MECHANICAL engineer, experienced all phases works and office engineering in lime, calcium carbide, oxygen and acetylene industries, desires permanent position with responsibility. PW-239, Factory Management and Maintenance, 330 West 42d St., New York City.

INDUSTRIAL ENGINEER—30, capable executive, 8 years practical experience in engineering, planning, factory operation and industrial management. Desire position with growing concern. PW-241, Factory Management & Maintenance, 520 North Michigan Ave., Chicago, Ill.

WANTED

ANYTHING within reason that is wanted in the industry served by Factory Management and Maintenance can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

UNUSUAL MEN

As subscribers to our Advisory Service we have a number of men of thoroughly sound character and excellent ability who have produced unusual results for employers. Ages 27 to 45. Compensation desired $1,800 to $25,000 plus opportunity for advancement. Inquiries from high grade employers are solicited. Complete information without obligation.

WILLIAM L. FLETCHER
Personnel Managers and Counselors
8 Newbury Street, Boston, Massachusetts

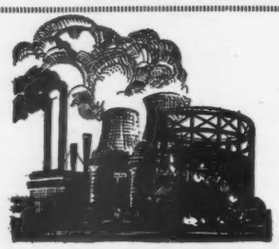
We
- Sell
- Buy
- Rent
- Repair
- Exchange
- All Makes
- and Sizes

GREGORY HI-GRADE-REBUILT
MOTORS
GENERATORS
TRANSFORMERS
METERS, FANS, PUMPS, ETC.
Always Dependable — Economical —
Money-Back Guarantee
GREGORY ELEC. CO.
1602 So. Lincoln St., Chicago

Motors • Generators
Transformers
Control
For Every Application
ELECTRIC GENERATOR & MOTOR COMPANY
Cleveland, Ohio

Complete Power Plant For Sale
Steel building, 2—1250 hp. Nordberg Diesel Engines, dir. conn. to 1070 kva. Westinghouse Generators, 1—1700 kva. Westinghouse Turbine Generator Set, 25 Steel Towers, 4—32½ kva. Fairbanks-Morse Diesel Generator Sets, 7 Triplex pumps, 100 hp. G.E. vert. slp. ring motor, etc.
Thousands of items in stock. Write for list.
CHICAGO ELECTRIC COMPANY
1326 W. Cermak Road, Chicago

ELECTRICAL MACHINERY
Motors and Generators, A.C. and D.C. for sale at Attractive Prices. Large Stock. New and Rebuilt. All Guaranteed. *Write for Stock List and Prices.*
V. M. NUSSBAUM & CO.
FORT WAYNE, IND.



THE VAST RESOURCES OF ENGLAND'S SECOND CITY AT INDUSTRY'S COMMAND

Birmingham, England's Second City, is the world's most comprehensive manufacturing centre and the obvious location for any industry related to its 1,200 trades. Birmingham possesses unequalled transport facilities, 400,000 workpeople, modern factories to rent or for sale, and recently 500,000 square feet have been built to manufacturers' requirements for rental. Birmingham is a busy, modern city, planned for industry, throbbing with energy; a virile, prosperous community whose motto is "Forward."
Address inquiries to the CITY OF

BIRMINGHAM

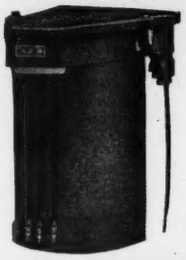
Information Bureau, The Council House, BIRMINGHAM 1, ENGLAND.
or The Travel and Industrial Development Association of Great Britain and Ireland 1 Pall Mall East, London, S.W.1.
British Empire Building, Rockefeller Center, New York.
28 Avenue des Champs Elysees, Paris.

WANTED

BUYER OF SURPLUS AND SALVAGE STOCKS
Metals, Chemicals, Raw Materials, Fabrics, Manufactured Products; Entire Plants, including Machinery, Tools, Equipment. LIQUIDATOR FOR BANKS, Receivers, Creditors' Committees, Estates.
HENRY K. FORT
2227 N. American Street, Philadelphia

"SEARCHLIGHT" IS
Opportunity Advertising
—to help you get what you want.
—to help you sell what you no longer need.
Take Advantage Of It
For Every Business Want
"Think SEARCHLIGHT First"
G-7

TRANSFORMERS



A Complete Stock. **Prompt Shipment.**

3—500 KVA Westinghouse Transformers, 60 cycle, 2400-106 volts. **$875.00 EACH**

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Hp.	Type	Speed
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600	G. E. sl. rg.	720
2-600	G. E. sl. rg.	252
600	G. E. syn.	257
600	Al. Ch. syn.	240
1-675	Al. Ch. syn.	900
400	West. sl. rg.	514
300	Al. Ch. sl. rg.	585
260	Al. Ch. syn.	720
200	G. E. syn.	900
2-200	West. sl. rg.	900
200	G. E. sl. rg.	900
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150	West. sl. rg.	720
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150	220-440-550	G.E.	600
150	2200-220-440	G.E.	720
100	220-440	G.E.	600
100	2200-550	Westghse.	900
100	550	G.E.	720
100	440-220	G.E.	720
100	550	G.E.	900
75	440-220	G.E.	900
75	220-440	G.E.	720

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Hp.	Volts	Speed	Make	Type
200	230	800	G.E.	RC
125	230	850	G.E.	RC
100	230	1150	G.E.	LC
100	230	625	Westghse.	SK
80	230	600	G.E.	RC
75	230	950	G.E.	RC

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Kw.	Volt	Speed	Make	Type
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100	250	725	Westghse.	SK
75	250	750	G.E.	RC
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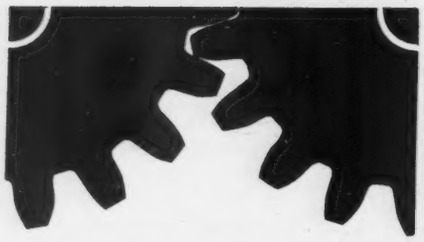

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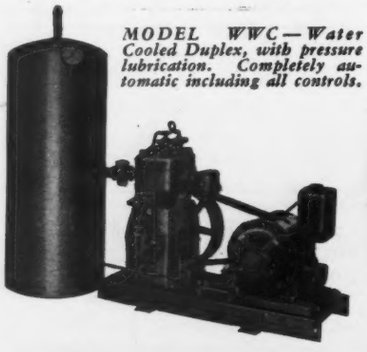

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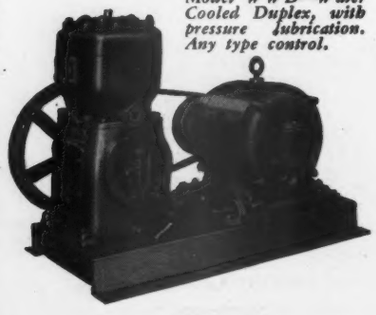

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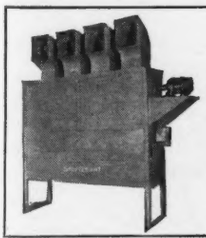

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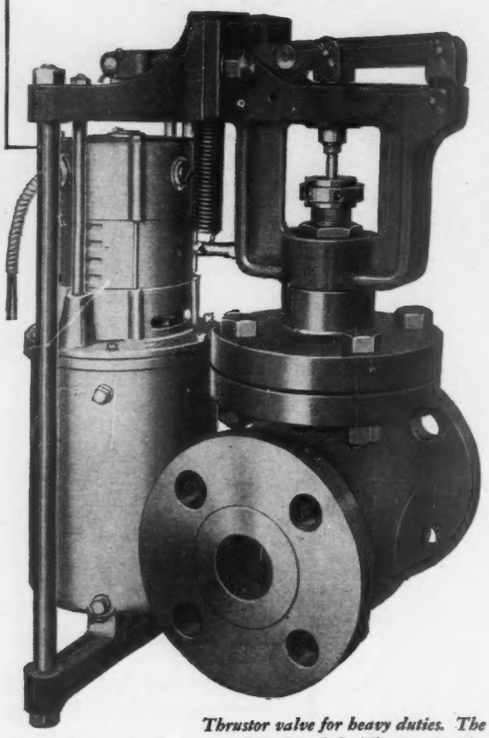

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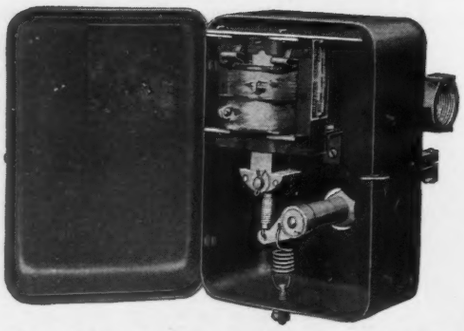

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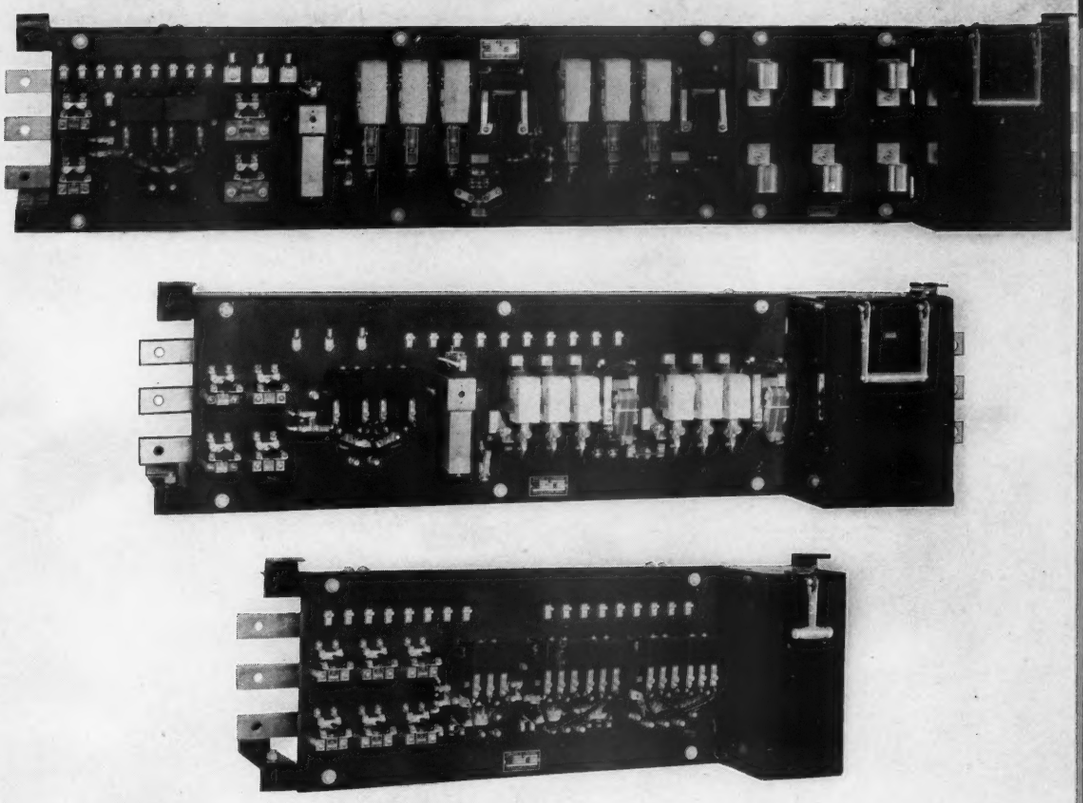

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